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OF THE

WASHBURN OBSERVATORY

OF THE

UNIVERSITY OF WISCONSIN.

VOL. III.

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WASHBURN OBSERVATORY.

FOUNDED BY

CADWALLADER C. WASHBURN,

BORN 1818; DIED 1882.

---

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\* Since August 15, 1884.

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# WASHBURN OBSERVATORY

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## I. INTRODUCTION.

In March, 1884, I offered on the part of the Washburn Observatory to observe the 303 fundamental stars for the southern zones of the *Astronomische Gesellschaft*.

As the force at the Observatory is small, it was not possible to engage to make more than four observations *per* star. This offer was accepted by Professor AUWERS who, at the same time, expressed a desire for six observations *per* star. It is probable that we shall be able to respond to Professor AUWERS' wish, and to obtain the six observations desired, in most cases. Work was begun May 2, 1884, and up to January 1, 1885, the following observations have been made:

Stars of the 303 list.....	1270
Other stars from the B. J.....	231
Stars of the Refraction list (Leyden and C. G. H.).....	298
Total observations .....	1799

Up to June 1 the pointings at the telescope were made by myself while the microscopes were read by Mr. TATLOCK. By the liberality of a friend of the Observatory,—O. H. INGRAM, Esq., of Eau Claire,— we were enabled to employ Mr. G. C. COMSTOCK, formerly assistant here, during the months June—September; and since September his services have been secured by an appropriation from the BACHE Fund of the National Academy of Sciences, which was put at our disposition by the Trustees of this Fund—Professors J. D. DANA, WOLCOTT GIBBS and J. E. HILGARD.

The observing list consists not only of the 303 stars above mentioned, but of the Refraction Stars which are being observed jointly by the observatories of Leyden and the Cape of Good Hope, and of some circumpolars selected here to complete the refraction list.

The present volume contains nothing relating to this work, which is not yet finished, except the tables of Nadir Points and of the constants  $a, b, c$ . The values of  $a$  given in the tables are preliminary only, being such as were deduced from a few of the stars of each night for the purpose of time determinations. They will serve to exhibit the degree of steadiness of the instrument in connection with the values given in Volume II, pages 61, 62, 63, 64.

#### DETERMINATION OF THE LATITUDE.

In 1873 the U. S. Coast and Geodetic Survey determined the latitude of a station on the University grounds, which has been connected with the Washburn Observatory, by three independent surveys in 1881 and 1884 (two observers.) The coast survey station is:

3".62 South and 25".05 East of the Meridian-Circle of the Observatory.

The Observatory has several independent determinations either in progress or finished as mentioned below, and as this station will thus be very well determined, the Superintendent of the Coast Survey has signified his intention of repeating his determination of the latitude of the former station and of adding a direct determination of the latitude of the Student's Observatory.

If the programme is carried out, the latitudes determined and the methods will stand as in the following table:

DATE.	OBSERVER.		INSTRUMENT.	METHOD.
	Name.	Institution.		
*1873.....	F. BLAKE .....	U. S. Coast Survey .....	Zenith Telescope No. 2..	TALCOTT'S (12 pairs of stars from B. A. C.).
*1881.....	G. C. COMSTOCK.	Washburn Observatory.	Fauth Zenith Telescope.	TALCOTT'S (26 pairs of stars from SAFFORD'S Cat.).
*1884.....	E. S. HOLDEN....	Washburn Observatory.	Fauth Zenith Telescope.	TALCOTT'S (10 pairs of stars from B. J. and Boss).
*1884.....	G. C. COMSTOCK.	Washburn Observatory.	Fauth Zenith Telescope.	TALCOTT'S (11 pairs of stars from B. J. and Boss).
*1884.....	G. C. COMSTOCK.	Washburn Observatory.	Fauth Transit.....	Prime Vertical Transits (69 determinations from B. J. and Boss).
†1884.....	E. S. HOLDEN....	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Standard Stars. (B. J.)
†1884.....	G. C. COMSTOCK.	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Standard Stars. (B. J.)
*1883.....	J. TATLOCK.....	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Polaris.
†1884-5....	E. S. HOLDEN....	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Polaris.
†1884-5....	M. UPDEGRAFF..	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Polaris.
†1885.....	G. C. COMSTOCK.	Washburn Observatory.	Repold Meridian Circle.	From Z. D. of Polaris.
1885.....	— — — — —	U. S. Coast Survey .....	Zenith Telescope No. 5..	TALCOTT'S (Station, University). } Same B. A. C.
1885.....	— — — — —	U. S. Coast Survey .....	Zenith Telescope No. 5..	TALCOTT'S (Station, Observatory). } stars as 1873.

\* Those marked with a star are completed and reduced.      † Those series marked with a dagger are begun and reduced to date.

‡ The 24 stars used by the Coast Survey in 1873 will be observed on the Meridian Circle in 1885, each 10 times.



## TACCHINI'S CATALOGUE OF 1001 SOUTHERN STARS.

Section V of this volume contains the places of 1001 southern stars, reduced from the observations made by Signor TACCHINI, at Palermo, in the years 1867, '68, '69 and published by him in *Bull. Meteor. del R. Osserv. di Palermo*, Vols. III, IV, V.

The reduction of these stars to 1850.0 has been made by my friend, the Rev. Father HAGEN, S. J., Professor of Astronomy at the College of the Sacred Heart, Prairie du Chien, Wisconsin. Their comparison with other catalogues for the detection of the (frequent) errors of printing has been made by myself, in the interest of the reduction of the Washington Zones of 1846-49.

## II. MERIDIAN CIRCLE.

The circle has been used since May 2, 1884 in the observation of a list of 303 fundamental stars for the Southern Zones of the *Astronomische Gesellschaft*, of a list of refraction stars and of a few miscellaneous stars. The table of Nadir Points and the Record of Constants follow.

The circle has had a thorough trial during the year 1884 in which some 1800 observations have been made, and it still appears to me an essentially perfect instrument.

There remains a large number of questions connected with the determination of absolute declinations which will require considerable study, which can only be undertaken after the completion of the observations of the 303 stars.

If I were now to order a circle anew from the Messrs. REPSOLD, I should choose one of this same size. The only important change I should wish to make would be to add a second graduated circle, divided to 2', and movable around the axis by a pinion, as in the Strassburg circle; and to have collimators of the same aperture as the telescope of the circle.

In the course of observations a few small points in which I think some minor changes could be advantageously made, have suggested themselves. The most important of these

would be a ready way to read the decades of degrees by a pointer, so that the circle could be quickly set within  $10^{\circ}$ .

At present all settings must be made by the setting microscope whose field of view is  $2^{\circ} 10'$ . The numbers belonging to the degrees are, of course, quite invisible while the circle is being moved. If a pointer could be so placed as to allow of reading a coarse graduation to  $10^{\circ}$  (say) on the *edge* of either circle, then the setting could be made much more quickly.

The handles for moderating the illumination are too short for use with zenith stars, unless the observing chair sent by the Messrs. REPSOLD is used. It is generally found to be more convenient not to use this.

The illuminating lamps have been improved by cutting a small window into the side of each of them opposite the flame, so that the height of the flame can be noted without opening the door. This window is glazed with mica. The lamps also give too much stray light in the room.

The arms of the level were wrapped with woolen listing, during the winter of 1884, and I think this an improvement. Several of the micrometers of the microscopes have required their springs to be strengthened, as these springs were not strong enough to move the slide for the wires, at temperatures near zero Fahr. In fact the instrument cannot be used satisfactorily at present for measuring Zenith Distances (on this account only) at temperatures below zero. This has been a serious drawback during the present winter season when all the clear nights have been very cold.

This difficulty can probably be remedied by strengthening the springs of the various micrometers.

The great length of the spider line in the Z. D. micrometer appears to me to be an imperfection. We have already had trouble with the sagging of the micrometer threads, and the original set has been replaced more than once.

## POSITION OF THE CIRCLE.

The Circle was West:

From 1884, May 20, to 1884, June 12,	
July 13,	July 24,
July 28,	Sept. 20,
Oct. 3,	Nov. 14,
Dec. 21,	?

The Circle was East:

From 1884, Mar. 5, to 1884 May 20,	
June 13,	July 13,
July 24,	July 28,
Sept. 20,	Oct. 3,
Nov. 14,	Dec. 21.

## PROBABLE ERRORS OF A SINGLE DECLINATION.

The declinations of the year 1884 have been completely reduced, and from all stars with more than four observations we find

Probable error of a single declination of a star in the 303 list:

For Observer E. S. H. =  $\pm 0''.40$  (259).

For Observer G. C. C. =  $\pm 0.44$  (389).

Probable error of a single declination of a star near the zenith (Leyden refraction stars) or of a polar star:

For Observer E. S. H. =  $\pm 0''.41$  (41).

For Observer G. C. C. =  $\pm 0.39$  (78).

It thus appears that the estimates of the precision of our observations given in Volume II, pp. 79, 80, which were derived from the work of Observer J. T., are not applicable to the present circumstances.

It may be of interest to add that the declinations of 1884 indicate a correction of  $+0''.30 \pm 0''.026$  to the constant of refraction of the Pulkowa Refraction Tables, in order that they should apply to Madison. Essentially the same correction has been determined at Albany.

## WIRE-INTERVALS OF THE GLASS-RETICLE.

The Glass-Reticle is described in *Publications of the Washburn Observatory*, Vol. II, p. 84.

For stars south of  $65^\circ$  the groups M (3 wires), O (5) and P (3) are used; for northern stars the group O of 13 wires is used.

A south star, Circle West, crosses the wires in the order, M, O, P. The wires retain their names in both positions of the clamp. The intervals were deduced from transits observed for determining the R. A., of the 303 fundamental stars for the southern zones of the *Astronomische Gesellschaft*.

$M_1$  to  $O_1$  (mid-wire.)

$12^s.012 \pm 0^s.006$ ; 21 N. stars; 220 S. stars.

$M_2$  to  $O_1$ .

$10.010 \pm 0.007$ ; 22 N. stars; 221 S. stars.

$M_3$  to  $O_1$ .

$7.986 \pm 0.006$ ; 26 N. stars; 220 S. stars.

$O_1$  to  $O_7$ .

$3.989 \pm 0.006$ ; 39 N. stars; 226 S. stars.

$O_4$  to  $O_7$ .

$1.991 \pm 0.006$ ; 39 N. stars; 226 S. stars.

$O_{10}$  to  $O_7$ .

$2.002 \pm 0.006$ ; 39 N. stars; 223 S. stars.

$O_{13}$  to  $O_7$ .

$4.048 \pm 0.006$ ; 39 N. stars; 221 S. stars.

$P_1$  to  $O_7$ .

$8.015 \pm 0.006$ ; 12 N. stars; 233 S. stars.

$P_2$  to  $O_7$ .

$10.035 \pm 0.006$ ; 10 N. stars; 233 S. stars.

$P_3$  to  $O_7$ .

$11.987 \pm 0.006$ ; 10 N. stars; 233 S. stars.

The reductions for the close wires of O are as follows:

$O_2$  to  $O_7$  ;  $3.356 \pm 0.004$ .

$O_3$  to  $O_7$  ;  $2.667 \pm 0.004$ .

$O_4$  to  $O_7$  ;  $1.336 \pm 0.004$ .

$O_5$  to  $O_7$  ;  $0.664 \pm 0.004$ .

$O_6$  to  $O_7$  ;  $0.682 \pm 0.004$ .

$O_8$  to  $O_7$  ;  $1.341 \pm 0.004$ .

$O_{11}$  to  $O_7$  ;  $2.666 \pm 0.004$ .

$O_{12}$  to  $O_7$  ;  $3.357 \pm 0.004$ .

The wires L and Q are those at which the micrometer bisections are made. Their reductions are:

L to O,  $20.17 \pm 0.019$  ; 39 stars.

Q to O,  $20.03 \pm 0.013$  ; 43 stars.

Complete tables of these reductions for every Declination (with the Arguments Dec. and Circ. Reading Circle W. and Circle E) have been computed by Mr. TATLOCK and Mr. COMSTOCK. I regret to add that this reticle was broken in April, 1885, through no fault of ours. The small central mirror fixed to the centre of the objective was not securely cemented to the lens and fell upon the reticle, completely destroying it. The reticle has been replaced by another and the mirror securely cemented to the lens.

#### DETERMINATION OF THE VALUE OF ONE REVOLUTION OF THE ZENITH-DISTANCE MICROMETER SCREW.

The observations detailed in Vol. II, page 35, of the *Publications of the Washburn Observatory* gave the value  $64''.527$ . Before the observations of the 303 stars were begun the instrument was thoroughly adjusted as to its objective, focusing, etc.

Observations to determine the value of the screw have been made as follows:

1884, July 8, G. C. C. and J. T.	Temp. = $71^{\circ}$
July 25, G. C. C. and J. T.	= $77^{\circ}$
Oct. 29, G. C. C.	= $49^{\circ}$
Oct. 31, A. M. L.	= $40^{\circ}$
Oct. 31, M. U.	= $40^{\circ}$
Nov. 1, M. U.	= $34^{\circ}$
Nov. 4, A. M. L.	= $42^{\circ}$
Nov. 5, A. M. L.	= $38^{\circ}$
Nov. 10, A. M. L.	= $47^{\circ}$

The concluded value is  $64''.5033 \pm 0''.0042$ .

No signs of a temperature co-efficient of any magnitude are evident in the observations, which include a range of  $39^{\circ}$  F.

The value given above has been used in the reduction of all observations since May 1, 1884.

# PERIODIC AND PROGRESSIVE ERRORS OF THE ZENITH-DISTANCE MICROMETER-SCREW.

Two series of pointings on the wires of the North Collimator were made on December 4 and 5, 1883. The spaces measured were 0.4883 and 0.2643 revolutions respectively. The corrections for periodic error resulted:

$$\text{Dec. 4} - 0''.0172 \cos u - 0''.0342 \sin u.$$

$$\text{Dec. 5} + 0''.0114 \cos u - 0''.0206 \sin u.$$

$$\text{Mean} - 0''.0029 \cos u - 0''.0274 \sin u.$$

These refer to the space from 4.0 to 15.0 revolutions. As the correction for periodic error is so small, it has not been taken into account in our reductions. 0.001 rev. of the screw =  $0''.064$ .

No sign of the existence of any progressive error in the screw is shown in our results.

## DIVISION ERRORS.

It has not been possible, so far, to attempt anything like a complete determination of the division errors. The corrections of the  $30^\circ$  diameters, have, however, been determined as follows:

Diameter  $0^\circ - 180^\circ$ .

Correction assumed as zero.

Diameter  $30^\circ - 210^\circ$ .

$c_{30} = +0''.037 \pm 0''.022$ ; 16 determinations.

Diameter  $60^\circ - 240^\circ$ .

$c_{60} = +0.360 \pm 0.038$ ; 24 determinations.

Diameter  $90^\circ - 270^\circ$ .

May 22,  $c_{90} = +0.45 \pm 0.032$ ; 10 determinations.

May 23,  $= +0.52 \pm 0.035$ ; 10 determinations.

May 24,  $= +0.53 \pm 0.022$ ; 10 determinations.

June 17,  $= +0.35 \pm 0.038$ ; 10 determinations.

June 19,  $= +0.38 \pm 0.019$ ; 10 determinations.

June 20,  $= +0.50 \pm 0.020$ ; 10 determinations.

Mean  $c_{90} = +0.455 \pm 0.011$ ; 60 determinations.

Diameter  $120^\circ - 300^\circ$ .

$c_{120} = -0.212 \pm 0.031$ ; 24 determinations.

Diameter  $150^\circ - 330^\circ$ .

$c_{150} = -0.074 \pm 0.040$ ; 16 determinations.

The average *p. e.* of a single determination is  $\pm 0''.11$ .

DETERMINATION OF THE HORIZONTAL FLEXURE OF THE REPOSED MERIDIAN CIRCLE BY OPPOSING COLLIMATORS.

During 1883 and 1884 sixty different determinations of the horizontal flexure were made by the programme described in Vol. II of the *Publications of the Washburn Observatory*, page 81.

The programme there given has been followed exactly, and special pains has been taken to make the measures only when the temperatures at the N. C., the S. C. and over the instrument were the same. In fact no series has been made with a difference of the extremes of these three temperatures so great as  $0^{\circ}.8$  F. The absolute temperatures have varied between  $82^{\circ}$  and  $43^{\circ}$ , however.

Following a valuable suggestion of Professor NEWCOMB'S the observations have usually been made during a steady rain-storm, which tends to equalize the temperatures.

The tables following give the separate results; the means are

$h = -0^{\circ}.13 \pm 0^{\circ}.05$ ;	E. S. H.;	18 observations.
$h = +0.25 \pm 0.06$ ;	G. C. C.;	16 observations.
$h = -0.11 \pm 0.05$ ;	J. T.;	26 observations.

The simple mean is  $+0^{\circ}.003$ ; the weighted mean is  $-0^{\circ}.019$ . The adopted result of this method of determining the flexure is  $h = 0^{\circ}.00$ .

Our experience has abundantly shown that the weakest point of this method as we are forced to practice it, is in the pointing of one collimator on the other.

The objectives of the collimators are too small to give sufficiently precise images. The pointing of the telescope upon the collimators is naturally much more precise and the source of the constant differences between observers is to be chiefly found in the collimator pointing and not in the telescope pointing, as is proved by experiment. The collimator objectives are large enough to give a sufficiently accurate value of the collimation in R. A. to be used in our daily reductions, though even for this purpose it appears to be better to have the collimators of the same aperture as the telescope.

But when we come to the determination of so small a

quantity as the flexure of a REPSOLD meridian-circle, it appears to be absolutely essential to have the three objectives employed of equal or nearly equal aperture.

Such large collimators cannot be levelled, it is true, but on the other hand the method of Nadirs seems to be preferable to the method of Horizontal Points for obtaining the zero of declinations, so that this disadvantage is a minor one.

In a circle which the Messrs. REPSOLD have made for the Lick Observatory the telescope and the two collimators have been made of 6 French inches aperture, for this reason.

The additional expense of such a construction appears to be fully warranted by the increased precision of the determination of a constant which is to be determined once for all, and then to enter as a factor into every declination.

Further observations on the horizontal flexure will be made with the object of getting an equal number of measures for each observer Circle E. and Circle W., and measures will also be made by other observers.

These measures are needed more for the purpose of studying the cause of the discrepancy between observers than for determination of the absolute value of the flexure, which is, in all probability, very small.

It should be remarked that the small size of the observing room and the height of the collimator piers prevent the making of reflex observations with advantage.

## HORIZONTAL FLEXURE: E. S. H., OBSERVER.

Date: 1884.		Circle.	h; Telescope turned through Zenith.	h; Telescope turned through Nadir.
May	5.....	E	+0'.06	+0'.31
	5.....	E	—0.25	—0.32
	6.....	E	—0.34	—0.50
	6.....	E	+0.04	+0.12
	6.....	E	+0.22	+0.24
	7.....	E	—0.48	—0.71
	7.....	E	—0.30	—0.76
	12.....	E	+0.17	+0.05
	12.....	E	+0.04	+0.10
Sums.....			—0.84	—1.47
Mean.....			—0'.13	±0'.05

18 observations.



## HORIZONTAL FLEXURE: G. C. C., OBSERVER.

DATE: 1884.	Circle.	h; Telescope turned through Zenith.	h; Telescope turned through Nadir.
June 2 .....	W.	+0'.09	+0'.02
28 .....	E.	+0'.88	+0'.06
24 .....	E.	+0'.59	+0'.30
July 7 .....	E.	+0'.32	-0'.01
7 .....	E.	+0'.34	+0'.40
7 .....	E.	+0'.88	+0'.82
22 .....	W.	-0'.29	+0'.34
22 .....	W.	-0'.04	-0'.17
Sums .....		+2'.27	+1'.76
Mean .....		+0'.25	±0'.06

16 observations.

## HORIZONTAL FLEXURE: J. T., OBSERVER.

DATE: 1883-84.	Circle.	h; Telescope turned through Zenith.	h; Telescope turned through Nadir.
October 13 .....	W.	-0'.15	+0'.14
24 .....	W.	+0'.79	+0'.15
Nov. 17 .....	W.	-0'.19	-0'.34
May 5 .....	E.	-0'.83	-0'.56
5 .....	E.	-0'.08	-0'.30
6 .....	E.	-0'.11	-0'.31
6 .....	E.	+0'.14	+0'.42
7 .....	E.	-0'.65	-0'.94
7 .....	E.	-0'.39	-0'.23
12 .....	E.	-0'.09	-0'.05
12 .....	E.	-0'.16	-0'.10
July 29 .....	W.	+0'.12	+0'.66
29 .....	W.	+0'.88	-0'.12
Sums .....		-1'.22	-1'.58
Mean .....		-0'.11	±0'.05

26 observations.

# RECORD OF NADIR-POINTS FROM 1884 APRIL 4, TO 1885 JANUARY 1.

Micrometer zero = 10.000 revolutions. The temperature, (after June 13) was read from a thermometer directly over the East Pier. When two observers are given, the first reads the micrometer, the second the microscopes:

DATE.	Sid Time.	C.rcle.	Obsr.	Temp.	Nadir Point.
1884.					
May 2....	14.2	E.	Hn.	.....	125° 30' 36" .65
2....	17.3	E.	Hn.	.....	30 35 .02
4....	3.0	Adjusted azimuth of instrument.			
7....	23.9	E.	T.	.....	30 35 .66
8....	11.5	E.	Hn.	.....	30 36 .52
8....	13.9	E.	Hn.	.....	30 35 .77
9....	6.0	Instrument adjusted in azimuth.			
9....	8.0	Instrument adjusted in level.			
10....	11.3	E.	Hn.	.....	125° 30' 35" .81
10....	15.5	E.	Hn.	.....	30 34 .36
13....	11.7	E.	Hn.	.....	30 35 .96
13....	16.0	E.	Hn.	.....	30 35 .57
15....	15.2	E.	Hn.	.....	30 34 .62
15....	19.4	E.	Hn.	.....	30 33 .56
19....	15.3	E.	Hn.	.....	30 34 .01
19....	19.2	E.	Hn.	.....	30 33 .71
20....	Reversed instrument. Circle is now	West.			
20....	11.5	W.	Hn.	.....	125° 23' 36" .49
21....	13.0	W.	Hn.	.....	23 36 .89
22....	13.0	W.	Hn.	.....	23 37 .07
26....	11.7	W.	Hn.	.....	23 36 .82
26....	13.2	W.	Hn.	.....	23 36 .60
27....	12.5	W.	Hn.	.....	23 36 .62
27....	14.3	W.	Hn.	.....	23 37 .01
28....	11.8	W.	Hn.	.....	23 37 .85
28....	14.3	W.	Hn.	.....	23 37 .89
30....	11.9	W.	Hn.	.....	23 38 .48
30....	14.4	W.	Hn.	.....	23 39 .37
June 3....	12.4	W.	Hn.	.....	23 38 .82
3....	15.0	W.	Hn.	.....	23 38 .44
3....	15.4	W.	C.	.....	23 37 .94
3....	17.8	W.	C.	.....	23 37 .31
5....	13.8	W.	C.	.....	23 37 .60
5....	16.4	W.	C.	.....	23 37 .64
6....	13.0	W.	C.	.....	23 36 .22
6....	14.5	W.	C.	.....	23 37 .15
6....	16.8	W.	C.	.....	23 36 .53
7....	13.2	W.	C.	.....	23 36 .46
7....	14.5	W.	C.	.....	23 37 .44
7....	16.7	W.	C.	.....	23 36 .93
9....	15.0	W.	C.	.....	23 36 .80

DATE	Sid. Time.	Circle.	Ob r.	Temp.	Nadir point.
1884.					
June 9....	18.7	W.	C.	.....	125° 23' 38".05
10....	15.9	W.	C.	.....	23 38.10
10....	19.2	W.	C.	.....	23 38.69
11....	14.5	W.	C.	.....	23 38.89
11....	16.1	W.	C.	.....	23 38.85
11....	19.3	W.	C.	.....	23 38.88
12....	8.5	Reversed instrument Circle is now East.			
12....	18.0	E.	C.	.....	30 28.49
12....	14.5	E.	C.	.....	30 27.92
12....	16.5	E.	C.	.....	30 28.30
13....	18.4	E.	C.	.....	30 28.81
13....	14.5	E.	C.	.....	30 27.18
13....	16.5	E.	C.	.....	30 27.25
14....	13.0	E.	C.	70.2	30 28.86
14....	14.5	E.	C.	66.8	30 28.15
14....	14.7	E.	C.	67.3	30 28.63
14....	15.2	E.	C.	66.1	30 27.79
14....	15.4	E.	C.	66.7	30 27.64
14....	15.7	E.	C.	65.3	30 27.71
14....	16.1	E.	C.	64.3	30 27.35
14....	16.5	E.	C.	64.0	30 27.27
15....	13.0	E.	T.	68.8	30 27.33
15....	15.4	E.	T.	67.9	30 27.48
16....	17.2	E.	T.	70.9	30 27.55
16....	19.2	E.	T.	67.5	30 26.82
21....	18.8	E.	C.	73.0	30 27.40
21....	22.3	E.	C.	68.9	30 26.74
24....	16.3	E.	C.	73.6	30 27.81
25....	19.3	E.	C.	65.5	30 26.67
25....	22.7	E.	C.	58.8	30 24.24
26....	Eye-end removed.				
July 7....	Eye-end replaced.				
9....	16.4	E.	C.	71.3	125° 33' 4.28
9....	16.8	E.	C.	69.1	33 3.66
9....	17.7	E.	T.	67.8	33 3.99
9....	18.6	E.	T.	67.2	33 3.20
9....	19.9	E.	C.	67.6	33 3.38
10....	16.0	E.	C.	74.6	33 3.92
10....	16.8	E.	C.	70.2	33 3.28
10....	17.7	E.	T.	68.6	33 2.85
10....	18.6	E.	T.	68.4	33 2.19
10....	20.3	E.	C.	67.0	33 3.03
12....	17.2	E.	C.	69.7	33 3.49
12....	0.2	E.	C.	62.0	33 2.61
13....	15.1	Reversed instrument. Circle is now West.			
13....	15.9	W.	C.	69.0	125° 26' 32.97
13....	17.2	W.	C.	64.4	26 32.58
13....	19.2	W.	C.	63.8	26 32.88
Changed adjustment of Objective and Ocular.					
18....	18.8	W.	C.	69.1	125° 26 30.23
18....	20.4	W.	C.	64.7	26 30.79
19....	21.6	W.	C.	66.3	26 30.31
19....	0.5	W.	C.	63.2	26 30.53
20....	18.8	W.	C.	69.8	26 30.90
20....	21.7	W.	C.	63.8	26 31.67
24....	Reversed instrument. Circle is now East.				
24....	21.6	E.	C.	72.8	125° 32 54.08
25....	21.6	E.	C.	75.6	32 54.74

DATE.	Sid Time.	Circle.	Obsr.	Temp.	Nadir-point.
1884.					
July 25....	23.8	E.	C.	66.7	125° 32' 53".51
25....	23.8	E.	T.	66.7	32 53 18
25....	1.4	E.	T.	70.4	32 53.71
26....	21.3	E.	C.	74.0	32 54.74
26....	23.9	E.	C.	69.9	32 54.07
26....	23.9	E.	T.	69.9	32 53.75
26....	1.7	E.	T.	68.0	32 53.29
27....	.....	E.	C.	72.3	32 54.75
27....	23.9	E.	C.	70.7	32 53.73
27....	23.9	E.	T.	70.7	32 53.80
27....	1.6	E.	T.	68.6	32 54.99
28....	Reversed	Instrument Circle is now			West.
30....	21.3	W.	C.	71.6	125 26 27.65
30....	0.4	W.	C.	67.8	26 26.79
31....	19.0	W.	C.	73.8	26 28.11
31....	22.0	W.	C.	68.0	26 28.96
Sept. 8....	18.8	W.	C.	80.3	125 26 26.33
8....	23.3	W.	C.	76.4	26 26.18
9....	18.9	W.	C.	80.0	26 26.54
9....	24.0	W.	C.	75.7	26 26.83
11....	18.8	W.	C.	71.4	26 28.56
11....	22.5	W.	C.	63.9	26 29.12
12....	23.2	W.	C.	67.0	26 29.17
12....	4.0	W.	C.	60.3	26 30.94
17....	23.1	W.	C.	63.8	26 28.89
17....	3.0	W.	C.	56.7	26 29.84
19....	23.7	W.	C.	66.0	26 28.84
19....	3.1	W.	C.	57.3	26 30.30
20....	Circle	reversed and is now			East.
20....	23.6	E.	C.	63.4	125 32 59.37
20....	3.0	E.	C.	51.9	32 57.37
24....	23.4	E.	C.	65.1	32 59.66
24....	3.5	E.	C.	55.5	32 56.63
28....	23.3	E.	C.	67.6	32 59.50
28....	3.5	E.	C.	61.4	32 57.35
Oct. 2....	23.7	E.	C.	73.1	32 59.16
2....	3.7	E.	C.	69.8	32 59.33
5....	23.8	Instrument		Reversed.	125 26 25.35
5....	3.7	W.	C.	60.6	26 28.68
5....	3.7	W.	C.	60.6	26 28.72
10....	23.7	W.	C.	59.1	26 32.04
10....	3.7	W.	C.	55.1	26 32.62
18....	13.0	W.	Hn.	64.	125 26 32.21
18....	13.7	W.	Hn.	64.	26 32.52
19....	0.8	W.	Hn.	64.	26 32.76
19....	1.4	W.	Hn.	64.	26 32.54
19....	13.1	W.	Hn.	69.	26 32.08
19....	13.5	W.	Hn.	69.	26 31.91
20....	1.0	W.	Hn.	62.	26 32.03
20....	1.4	W.	Hn.	62.	26 31.85
21....	13.2	W.	Hn.	49.	26 28.50
22....	12.9	W.	Hn.	37.	26 28.33
22....	13.4	W.	Hn.	37.	26 27.88
22....	13.6	W.	A. M. L.	37.	26 27.93

DATE.	Sid. Time.	Circle.	Obsr.	Temp.	Nadir Poin <sup>t</sup> .
1884.					
Oct. 23....	13.0	W.	Hn.	(43.)	125° 26' 29".68
24....	0.9	W.	Hn.	43.	26 30.68
24....	1.4	W.	Hn.	43.	26 30.92
24....	1.6	W.	U.	43.	26 31.44
24....	13.0	W.	Hn.	47.	26 30.99
24....	12.4	W.	Hn.	47.	26 30.50
24....	13.9	W.	A. M. L.	47.	26 30.01
24....	14.0	W.	U.	47.	26 31.89
26....	13.0	W.	Hn.	41.	26 30.78
27The bolts fastening			pier-heads	to piers	were tighten <sup>d</sup> .
27....	13.0	W.	Hn.	?	125 26 18.36
27....	13.0	W.	A. M. L.	?	26 18.65
28....	1.0	W.	Hn.	42.	26 28.37
Nov. 1....	13.0	W.	Hn.	42.	26 19.29
2....	1.4	W.	Hn.	42.	26 20.24
2....	13.0	W.	Hn.	42.5	26 19.37
4....	12.8	W.	U.	33.	26 20.92
6....	2.6	W.	Hn.	41.	26 19.37
6....	5.4	W.	Hn.	38.5	26 20.19
6....	13.0	W.	Hn.	42.	26 19.36
6....	13.5	W.	Hn.	42.	26 19.88
7....	1.0	W.	Hn.	44.3	26 19.71
7....	1.5	W.	Hn.	43.	26 19.87
7....	2.6	W.	Hn. & C.	41.5	26 20.05
7....	6.2	W.	Hn. & C.	38.	26 19.14
7....	13.0	W.	Hn.	42.5	26 19.24
7....	13.5	W.	Hn.	44.5	26 19.55
8....	0.7	W.	U.	35.5	26 19.37
8....	2.1	W.	U.	35.5	26 19.88
9....	0.8	W.	Hn.	48.	26 20.31
9....	1.6	W.	Hn.	50.	26 20.24
9....	13.1	W.	Hn.	47.	26 20.05
11....	0.9	W.	Hn.	40.5	26 21.26
11....	2.9	W.	Hn. & C.	41.5	26 20.54
11....	6.3	W.	Hn. & C.	37.0	26 22.58
11....	13.0	W.	U.	41.9	26 21.68
11....	13.5	W.	U.	42.9	26 21.42
12....	1.0	W.	Hn.	42.2	26 20.11
12....	1.6	W.	W.	43.3	26 20.26
12....	12.9	W.	Hn.	43.0	26 19.81
12....	13.6	W.	Hn.	44.1	26 20.41
13....	0.9	W.	Hn.	45.5	26 19.93
13....	1.6	W.	Hn.	43.7	26 20.28
13....	2.7	W.	Hn. & C.	47.	26 19.76
13....	6.2	W.	Hn. & C.	43.	26 21.16
13....	12.9	W.	Hn.	.....	26 20.56
14....	17.0	Circle reversed and	is now	East.	
15....	1.6	E.	Hn.	49.	125 32 57.92
15....	5.3	E.	Hn. & C.	44.	32 56.89
16....	13.5	E.	Hn.	37.	32 58.77
16....	13.5	E.	U.	37.	32 58.49
17....	0.8	E.	Hn.	37.5	32 59.88
17....	1.5	E.	Hn.	36.0	32 59.90
17....	12.9	E.	Hn.	35.0	32 58.76
17....	13.5	E.	Hn.	34.	32 59.21
18....	1.0	E.	Hn.	35.9	32 59.43
18....	3.0	E.	Hn.	30.7	32 59.37

DATE	Sid. Time.	Circle.	Obsr.	Temp.	Nadir point.
1884.					
Nov. 18....	5.9	E.	Hn. and C.	25° .0	125° 32' 57".76
18....	1.1	E.	U.	25 .5	32 58.57
19....	13.0	E.	Hn.	36 .0	32 58.44
19....	13.4	E.	Hn.	36 .0	32 58.79
20....	1.0	E.	Hn.	37 .5	32 59.51
20....	1.4	E.	Hn.	37 .9	32 59.49
20....	2.7	E.	Hn. and C.	37 .5	32 57.84
20....	5.5	E.	Hn. and C.	31 .	32 57.57
25....	4.4	E.	Hn. and C.	20 .5	33 4.20
27....	0.8	E.	Hn.	21 .	33 2.78
27....	1.5	E.	Ho.	21 .	33 2.82
27....	4.7	E.	Hn. and C.	19 .	33 1.48
27....	6.9	E.	Hn. and C.	17 .	33 1.13
28....	1.7	E.	U.	23 .	33 2.97
29....	1.6	E.	U.	25 .3	33 1.93
30....	0.8	E.	Hn.	21 .	33 1.89
30....	1.6	E.	Hn.	24 .	33 2.02
30....	2.9	E.	Hn. and C.	17 .	33 0.19
30....	4.6	E.	Hn. and C.	17 .5	33 1.02
Dec. 2....	0.9	E.	Hn.	31 .	33 1.98
2....	1.4	E.	Hn.	32 .	33 1.76
2....	4.0	E.	Hn. and C.	32 .	33 1.46
2....	5.3	E.	Hn. and C.	32 .	33 1.41
2....	0.9	E.	U.	29 .8	33 0.54
2....	1.8	E.	U.	29 .0	33 1.10
3....	1.5	E.	Hn.	38 .0	33 2.04
3....	3.1	E.	Hn.	36 .	33 1.15
3....	4.2	E.	Hn.	37 .	33 1.56
3....	13.5	E.	U.	37 .	33 1.62
4....	0.8	E.	Hn.	37 .5	33 1.22
4....	1.2	E.	Hn.	38 .0	33 1.28
8....	12.9	E.	U.	23 .5	33 0.44
8....	13.6	E.	U.	23 .8	33 0.60
9....	0.8	E.	Hn.	30 .5	33 1.41
9....	1.6	E.	Hn.	30 .5	33 1.68
9....	2.8	E.	Hn.	27 .	33 1.01
9....	4.2	E.	Hn.	27 .9	33 0.94
9....	12.8	E.	U.	29 .5	33 0.51
9....	13.6	E.	U.	30 .0	33 0.56
10....	0.9	E.	Hn.	31 .0	33 1.09
*10....	1.6	E.	Hn.	31 .0	33 1.09
**10....	1.8	E.	Hn.	31 .0	33 1.42
10....	12.9	E.	U.	25 .5	33 0.97
15....	0.9	E.	Hn.	15 .9	33 1.33
15....	1.5	E.	Hn.	15 .5	33 1.07
17....	0.9	E.	Hn.	4 .0	33 4.90
17....	1.5	E.	Hn.	3 .0	33 5.06
18....	1.0	E.	Hn.	-10 .	33 7.66
19....	1.0	E.	U.	+2 .0	33 7.38
19....	1.6	E.	U.	+2 .0	33 6.93

\* By placing mic. wire alternately more and less.

\*\* By superposition of wires, as usual.

DATE,	Sid. Time.	Circle.	Obsr.	Temp.	Nadir point
1884.					
Dec. 21....	Circle rev	ersed.	Now West.		
22....	0.9	W.	Hn.	+4 .0	125° 26' 56".03
23....	1.6	W.	Hn.	+4 .0	26 55.59
24....	0.9	W.	U.	+3 .0	26 53.47
24....	1.5	W.	U.	+3 .0	26 53.29

## RECORD OF CONSTANTS FROM 1884, MAY 1, TO 1885, JANUARY 1.

N. B. The column *c* gives the setting of the R. A. Micrometer for  $c=0$ .

DATE.	Sid. Time.	<i>a</i>	<i>b</i>	<i>c</i>	
1884.					
May 2	10.3	<sup>s</sup> -1.695	<sup>s</sup> -0.386	.009	Hn. Circle East.
2	17.5	.....	.....	.009	Hn. [justed
4	3.0	.....	.....	.....	Hn. azimuth ad-
9	6.0	.....	.....	.....	Hn. azimuth ad-
10	7.9	.....	.....	.054	Hn. [justed.
10	11.0	{ +0.417	+0.002	.....	Hn.
10	15.2	.....	+0.088	.....	Hn.
13	7.0	.....	.....	.062	Hn.
13	11.4	+0.327	+0.125	.....	Hn.
13	16.2	.....	+0.169	.....	Hn.
15	14.6	.....	.....	.060	Hn.
15	14.9	.....	+0.226	.....	Hn.
15	19.5	{ +0.473	+0.426	.....	Hn.
19	14.5	.....	.....	.061	Hn.
19	14.9	{ +0.204	+0.073	.....	Hn.
19	19.4	.....	+0.100	.....	Hn.
20	.....	.....	.....	.....	Reversed Circle
20	10.8	.....	.....	.068	Hn. [West.
20	11.3	.....	+0.198	.....	Hn.
21	11.0	.....	.....	.080?	Hn.
22	11.0	.....	.....	.062	Hn.
22	11.3	.....	-0.096	.....	Hn.
23	8.8	.....	.....	.062	Hn.
26	11.3	.....	.....	.066	Hn.
26	11.5	{ +0.158	+0.208	.....	Hn.
26	13.4	.....	+0.173	.....	Hn.
27	11.5	.....	.....	.063	Hn.
27	12.0	.....	+0.210	.....	Hn.
27	14.6	.....	+0.253	.....	Hn.
27	12.6	+0.033	.....	.....	Hn.
28	11.4	.....	.....	.063	Hn.
28	11.7	.....	+0.306	.....	Hn.
28	12.6	-0.081	.....	.....	Hn.
28	14.6	.....	+0.313	.....	Hn.
30	9.1	.....	.....	.064	Hn.
30	11.8	.....	+0.202	.....	Hn.
30	13.3	-0.071	.....	.....	Hn.
30	14.7	.....	+0.209	.....	Hn.
June 3	11.9	.....	.....	.062	Hn.
3	12.2	.....	+0.151	.....	Hn.
3	13.4	+0.097	.....	.....	Hn.
3	18.0	.....	+0.095	.....	Hn.
5	13.0	.....	.....	.067	C.
5	13.6	.....	-0.016	.....	C.
5	14.6	+0.098	.....	.....	C.
5	17.5	.....	+0.037	.....	C.
6	12.7	.....	.....	.069	C.
6	12.9	.....	+0.144	.....	C.
6	15.1	+0.160	.....	.....	C.
6	16.7	.....	+0.093	.....	C.



DATE.	Sid. Time.	a	b	c	
1884.					
June 7....	12.8	.....	.....	.066	C.
7....	13.0	.....	+0.010	.....	C.
7....	15.1	+0.148	.....	.....	C.
7....	16.9	.....	+0.048	.....	C.
9....	14.8	.....	.....	.065	C.
9....	15.2	.....	+0.202	.....	C.
9....	17.9	+0.032	.....	.....	C.
9....	18.9	.....	+0.204	.....	C.
10....	15.0	.....	.....	.069	C.
10....	15.4	.....	+0.223	.....	C.
10....	17.9	+0.142	.....	.....	C.
10....	19.5	.....	+0.246	.....	C.
11....	13.8	.....	.....	.063	C.
11....	14.1	.....	+0.166	.....	C.
11....	17.8	+0.214	.....	.....	C.
11....	19.4	.....	+0.132	.....	C.
12....	8.2	.....	+0.139	.....	C.
12....	8.5	Reversed instrument.	Circle is now	East.	
12....	9.2	.....	+0.162	.....	C.
15....	13.9	.....	+0.216	.....	C.
15....	14.7	+0.272	.....	.....	C.
16....	18.6	.....	+0.050	.....	C.
16....	18.0	+0.250	.....	.....	C.
21....	18.0	.....	.....	.061	C.
21....	18.6	.....	+0.197	.....	C.
21....	21.1	+0.389	.....	.....	C.
21....	22.5	.....	+0.200	.....	C.
24....	15.8	.....	.....	.066	C.
24....	16.1	.....	+0.305	.....	C.
25....	18.8	.....	.....	.060	C.
25....	19.1	.....	+0.468	.....	C.
25....	21.1	+0.436	.....	.....	C.
25....	22.5	.....	+0.435	.....	C.
26....	.....	Eye end removed for repairs.	.....	.....	
July 9....	16.0	.....	.....	.867	C.
9....	16.3	.....	+0.468	.....	C.
9....	16.9	.....	+0.435	.....	C.
9....	17.2	.....	+0.420	.....	C.
9....	19.3	+0.513	.....	.....	C.
9....	20.0	.....	+0.524	.....	C.
10....	15.8	.....	.....	.869	C.
10....	16.1	.....	+0.402	.....	C.
10....	16.9	.....	+0.418	.....	C.
10....	19.7	+0.503	.....	.....	C.
10....	20.5	.....	+0.423	.....	C.
10....	20.3	.....	.....	.....	C.
12....	18.8	.....	.....	.866	C.
12....	19.0	.....	+0.469	.....	C.
12....	19.3	.....	+0.466	.....	C.
12....	21.1	+0.539	.....	.....	C.
12....	0.0	.....	+0.481	.....	C.
13....	15.0	.....	+0.553	.....	C.
13....	Reversed instrument.	Circle is now	West.	.....	
13....	15.3	.....	+0.608	.....	C.
13....	15.4	.....	.....	.857	C.
13....	15.8	Adjusted inclination of instrument.	.....	.....	C.
13....	16.0	.....	—0.092	.....	C.
13....	16.8	.....	—0.060	.....	C.

DATE.	Sid. Time.	a.	b.	c.	
1884.					
July 13	17.2	+0.670	.....	.....	C.
13	17.3	.....	—0.011	.....	C.
13	19.1	.....	—0.054	.....	C.
16	Objective removed	from instr.	ment for 5	minutes.	
18	Objective removed	and adjusted	in cell.		
18	15.7	.....	.....	.791	C.
18	18.4	.....	.....	.786	C.
18	18.9	.....	+0.056	.....	C.
18	19.8	+0.484	.....	.....	C.
18	20.0	.....	+0.011	.....	C.
19	21.3	.....	+0.016	.....	C.
19	0.1	.....	.....	.792	C.
19	21.9	+0.500	.....	.....	C.
19	0.4	.....	+0.024	.....	C.
20	18.3	.....	.....	.790	C.
20	18.6	.....	+0.004	.....	C.
20	20.8	+0.608	.....	.....	C.
20	21.8	.....	+0.031	.....	C.
24	Reversed instrument.	Circle is	now	East.	
24	21.0	.....	.....	.785	C.
24	21.4	.....	—0.031	.....	C.
25	21.1	.....	.....	.789	C.
25	21.5	.....	+0.011	.....	C.
25	22.0	+0.581	.....	.....	C.
25	0.1	.....	+0.008	.....	C.
26	21.2	.....	.....	.781	C.
26	21.5	.....	+0.025	.....	C.
26	22.0	+0.486	.....	.....	C.
26	0.1	.....	+0.071	.....	C.
27	21.2	.....	.....	.778	C.
27	21.6	.....	+0.058	.....	C.
27	22.2	+0.385	.....	.....	C.
27	1.0	.....	+0.076	.....	C.
28	Reversed instrument.	Circle is	now	West.	
30	20.8	.....	0	.778	T.
30	21.1	.....	+0.158	.....	T.
30	0.3	.....	+0.154	.....	T.
31	18.5	.....	.....	.782	T.
31	18.8	.....	+0.192	.....	T.
31	21.8	.....	+0.163	.....	T.
August 4	22.6	+0.13:	+0.272	.....	Hn.
6	17.7	+0.23	+0.182	.780	Hn.
7	17.7	—	+0.208	.....	Hn.
8	17.6	—	+0.229	.....	Hn.
9	8.0	.....	.....	.784	Hn.
9	17.0	+0.170	+0.201	.....	Hn.
10	9.0	.....	.....	.788	Hn.
11	20.2	+0.24	+0.071	.....	Hn.
13	18.0	+0.21	+0.084	.787	Hn.
14	17.5	+0.28	+0.073	—	Hn.
15	17.9	+0.20	+0.081	—	Hn.
18	18.0	+0.30	+0.067	.787	Hn.
21	10	—	+0.022	.790	Hn.
21	10	.....	.....	.787	Hn.

DATE.	Sid Hour.	a.	b.	c.	Setting of N.C. on S. C.	
1884.						
August 23	10.	.....	.....	.785	.701	Hn.
23	10.	.....	+0.400	.782	.700	U.
25	10.	.....	+0.288	.785	.701	U.
25	10.	.....	+0.247	.786	.698	U.
25	17.5	+0.10	+0.296	.....	.....	Hn.
26	18.4	+0.094	+0.281	.....	.....	U.
27	11.5	.....	+0.284	.784	.703	U.
28	19.0	.....	.....	.783	.704	Hn.
28	17.2	+0.085	+0.209	.....	.....	Hn.
	17.3	.....	+0.205	.....	.....	Hn.
	17.5	.....	+0.203	.....	.....	Hn.
	17.8	.....	+0.211	.....	.....	Hn.
	18.0	.....	+0.185	.....	.....	Hn.
	18.6	.....	+0.209	.....	.....	Hn.
	19.0	.....	+0.228	.....	.....	U.
29	16.	.....	.....	.790	.708	Hn.
29	16.	.....	.....	.792	.710	Hn.
31	20.7	[+0.12]	+0.23	.....	.....	U.
September 2	19.2	+0.06	+0.209	.786	.709	Hn.
3	16.5	.....	.....	.783	.705	U.
4	20.7	+0.004	+0.177	.....	.....	Hn.
4	16.5	.....	.....	.783	.701	U.
5	18.0	.....	+0.044	.....	.....	Hn.
5	19.3	+0.07	+0.071	.....	.....	Hn.
6	16.5	.....	+0.071	.781	.694	U.
7	19.5	+0.22	-0.189	.787	.696	C.
8	16.0	.....	+0.128	.785	.700	U.
8	19.1	.....	+0.070	.788	.708	C.
9	15.5	.....	+0.148	.791	.712	U.
9	19.0	+0.349	+0.194	.788	.708	C.
11	19.2	.....	+0.400	.788	.713	C.
12	16.3	.....	+0.396	.788	.717	U.
12	23.3	-0.007	+0.347	.783	.719	C.
16	17.8	.....	+0.336	.785	.714	U.
16	23.5	+0.140	+0.301	.....	.....	C.
17	17.7	.....	+0.359	.783	.717	U.
17	1.5	-0.040	+0.365	.784	.709	C.
19	17.5	.....	+0.312	.782	.714	U.
19	23.9	.....	+0.279	.782	.703	C.
20	17.6	.....	+0.291	.779	.706	U.
20	23.8	.....	+0.310	.779	.699	C.
22	17.7	.....	+0.244	.787	.699	U.
23	17.8	.....	+0.116	.786	.705	U.
24	23.7	+0.087	+0.212	.784	.704	C.
24	3.7	.....	+0.268	.....	.....	C.
25	17.9	.....	+0.160	.785	.705	U.
26	18.2	.....	+0.099	.787	.711	U.
27	18.5	.....	+0.113	.786	.700	U.
28	18.3	.....	+0.112	.787	.699	U.
28	23.5	.....	+0.198	.783	.674	C.
30	18.4	.....	+0.158	.791	.709	U.
October 1	18.3	.....	+0.183	.787	.700	U.
2	18.3	.....	+0.079	.791	.689	U.
2	0.0	+0.135	+0.070	.785	.684	C.
3	18.5	.....	+0.143	.786	.691	U.
4	19.0	.....	+0.121	.784	.698	U.
5	18.7	.....	+0.067	.783	.702	U.

DATE:	Sid Hour.	a.	b.	c.	Setting of N. C. on S. C.	
1884.						
Oct. 5	0 0	+0.086	+0.163	.786	.686	C.
6	18.6	.....	+0.266	.786	.699	U.
7	19.0	.....	+0.228	.782	.708	U.
8	18.9	.....	+0.253	.782	.706	U.
8	0.0	-0.051	+0.236	.....	.....	U.
9	19.0	.....	+0.332	.776	.714	U.
10	15.9	.....	+0.263	.780	.710	U.
10	23.9	.....	+0.267	.785	.698	C.
11	19.1	.....	+0.207	.785	.708	U.
12	0.3	-0.027	+0.106	.....	.....	U.
13	19.4	.....	+0.142	.780	.716	U.
14	19.5	.....	+0.171	.779	.708	U.
14	8.0	.....	.....	.788	.716	U.
15	19.5	.....	+0.255	.783	.713	U.
15	22.9	-0.171	+0.197	.....	.....	U.
16	19.7	.....	.....	.776	.720	U.
17	19.8	.....	+0.206	.777	.713	U.
18	19.5	.....	+0.262	.778	.710	U.
19	22.0	-0.147	+0.157	.786	.710	U.
20	19.0	.....	+0.179	.784	.711	U.
21	19.9	.....	+0.208	.784	.707	U.
22	19.7	.....	+0.419	.782	.710	U.
22	4.4	-0.675	+0.480	.....	.....	U.
23	19.9	.....	+0.519	.781	.709	U.
24	19.8	.....	+0.357	.781	.705	U.
25	19.1	.....	+0.232	.783	.708	U.
26	10.0	.....	+0.186	.....	.....	U.
28	19.6	-0.789	-0.048	.....	.....	U.
Nov. 1	3.0	-0.468	-0.028	.....	.....	U.
2	0.3	-0.52	-0.109	.....	.....	U.
3	19.5	.....	.....	.808	.710	Hn.
4	20.3	.....	.....	.811	.713	U.
6	2.3	.....	.....	.808	.705	Hn.
6	5.	.....	-0.136	.....	.....	Hn.
6	20.5	-0.780	-0.098	.....	.....	U.
7	2.6	.....	.....	.808	.712	Hn.
9	0.3	-0.269	-0.262	.....	.....	U.
10	19.5	.....	.....	.817	.719	U.
11	2.8	.....	.....	.808	.720	Hn.
13	21.0	-0.500	-0.182	.814	.715	U.
13	3.0	.....	.....	.809	.718	Hn.
15	1.7	.....	.....	.808	.713	Hn.
17	21.0	-0.56	0.000	.....	.....	U.
18	2.7	.....	+0.138	.808	.706	Hn.
18	5.9	.....	+0.234	.....	.....	Hn.
20	2.7	-0.49	-0.039	.809	.707	Hn.
25	4.3	.....	+0.096	.806	.715	Hn.
25	5.5	-0.893	+0.095	.....	.....	C.
27	3.9	.....	-0.109	.810	.721	Hn.
27	7.0	.....	-0.436	.....	.....	C.
29	3.0	-0.833	0.000	.....	.....	U.
30	2.2	.....	-0.028	.806	.714	Hn.
30	3.2	.....	-0.003	.....	.....	C.
30	4.3	.....	+0.021	.....	.....	C.
Dec. 2	3.0	.....	-0.206	.812	.719	Hn.
2	5.3	.....	-0.228	.....	.....	C.
3	4.1	-0.674	-0.281	.810	.709	Hn.

DATE.	Sid. Hour.	a.	b.	c.	Setting of N. C. on S. C.	
1884.						
Dec. 8	4.3	-0.514	-0.358	.812	.709	Hn.
9	2.7	.....	-0.285	.....	.....	C.
9	2.8	.....	.....	.....	.....	C.*
9	3.0	.....	-0.280	.....	.....	C.
9	4.3	.....	-0.260	.....	.....	C.
9	4.5	.....	.....	.802	.708	Hn.
10	1.7	.....	.....	.808	.708	Hn.**
15	3.2	.....	+0.007	.809	.715	Hn.
17	2.3	.....	.....	.807	.728	Hn.
17	3.5	-0.83	+0.305	.....	.....	C.
18	1.7	-0.90	+0.535	.....	.....	U.
24	23.5	-0.585	-0.224	.....	.....	U.
26	4.0	-0.25	-0.208	.808	.737	Hn.
31	4.0	-0.23	+0.043	.812	.703	Hn.

\* *b* over mercury = - 0.301.

\*\* Index of R. A. mic. changed.

### III. REDUCTION OF OBSERVATIONS MADE BY TWO OBSERVERS FOR THE DETERMINATION OF THE LATITUDE OF THE WASHBURN OBSERVATORY BY THE ZENITH TELESCOPE, (TALCOTT'S METHOD).

BY GEORGE C. COMSTOCK.

Prior to 1884 two determinations of latitude had been made at Madison by TALCOTT's method (see *Publications of the Washburn Observatory*, vol. i, p. 7.), but as in neither of these determinations were the stars reduced to any fundamental system, it was decided to re-determine the latitude by this method using only fundamental stars.

The instrument used for this purpose was the 3-inch Fauth transit described in vol. i, of *Publications of the Washburn Observatory*, p. 33. Since the date of that description the objective has been re-figured; the value of 1 rev. of the micrometer screw was therefore re-determined by measurement, on seven nights, of the difference of declination of  $\alpha$  and  $\gamma$  *Coronæ Borealis* and by observation on one night of transits of a circumpolar star (Gr. 2456,  $\delta=80^{\circ} 15'$ ), the micrometer thread being placed parallel to the meridian. These determinations gave respectively:

$$1 \text{ rev.} = 55''.18 \pm 0''.006. \quad \text{wt.} = 3.$$

$$= 55''.21 \pm 0''.011. \quad \text{wt.} = 1.$$

$$\text{Adopted, } 1 \text{ rev.} = 55''.19 \pm 0''.005.$$

A new determination of the value of one division of the latitude level was also made, by means of the micrometer, giving

$$1 \text{ div.} = 3''.27 \pm 0''.015.$$

This value corresponds to a radius of 413 feet. A more sensitive level has since been provided. The eye-piece employed in all the observations was a diagonal one, giving a power of 120 diameters.

The observations were made between June 28, and July 10, 1884, inclusive, by Prof. E. S. HOLDEN and Mr. G. C. COMSTOCK. The observing list with the number of observations of each pair by each observer follows:

## OBSERVING LIST.

No.	Star.	Mag.	R. A.		Dec.	Zenith Dist.		No. of Obs.	
			h.	m.		°	'	E.S.H.	G.C.C.
1	33 Bootis.....	5.6	14	34.6	+44 54	1	50		
	$\beta$ Bootis.....	3	14	57.6	40 51	2	13	.....	2
2	$\delta$ Bootis.....	3	15	11.0	+33 45	9	22		
	B.A.C. 5071 B.	6	15	16.9	52 22	9	17	4	2
3	$\iota$ Draco.....	3	15	23.3	+59 22	16	17		
	Cor. Bor...	2	15	29.8	27 6	15	59		
	$\gamma$ Cor. Bor...	4	15	37.9	26 40	16	25	6	3
4	$\epsilon$ Cor. Bor...	4.5	15	52.8	+27 13	15	52		
	$\vartheta$ Draco.....	3	15	59.8	58 53	15	58	6	3
5	Gr. 2343.....	5	16	22.1	+55 28	12	24		
	32 Herculis B.	6	16	29.1	30 44	13	21	3	3
6	B.A.C. 5568 B.	6	16	33.0	+46 51	3	47		
	$\eta$ Herculis...	3.4	16	38.9	39 9	3	56	3	3
7	$\theta$ Herculis B.	4.5	17	13.6	+37 25	5	40		
	$\alpha$ Herculis...	5.8	17	23.7	48 21	5	16	6	3
8	$\xi$ Draco.....	3.4	17	51.5	+56 53	13	48		
	$\xi$ Herculis...	4.3	17	53.3	29 16	13	49	4	3
9	36 Draco.....	5	18	13.2	+64 21	21	16		
	109 Herculis..	4	18	18.7	21 43	21	22	4	3
10	Gr. 2640.....	6	18	35.8	+65 23	22	18		
	110 Herculis..	4	18	40.7	20 26	23	39	2	3
11	$\epsilon$ Aquilae....	4	18	54.4	+14 55	28	10		
	$\nu$ Draco.....	5	18	55.8	71 9	28	4	3	3

The declinations of the four stars of this list to whose names the letter B is appended are taken from Boss's *Declinations of Fixed Stars*; all other declinations are from the *Berliner Astronomisches Jahrbuch für 1884*. The systematic corrections to reduce Boss's declinations to AUWERS' system which are contained in the supplement to the *Jahrbuch* for 1884, have been applied.

The results from the different pairs of stars have been combined by a system of weights based upon a consideration of the probable errors of the declinations employed and of the errors of observation. From a separate discussion for each observer of the discordances, *inter se*, of the results from those pairs which have been observed three or more times, it appears that the probable error of a single latitude result, when the probable errors of the declinations are eliminated, is, for E. S. H.  $\pm 0''.52$ ; for G. C. C.  $\pm 0''.33$ . The formulæ for the weights (See CHAUVENET'S *Spherical and Practical Astronomy*, vol.ii, p. 356) are therefore

$$\text{E. S. H. } p = \frac{m}{r(\delta_1)^2 + r(\delta_2)^2 + \frac{1''.08}{n}}$$

$$\text{G. C. C. } p = \frac{m}{r(\delta_1)^2 + r(\delta_2)^2 + \frac{0''.44}{n}}$$

in which  $m$  is an arbitrary constant,  $n$  the number of observations to whose mean the weight  $p$  is to be assigned, and  $r ( )$  is a symbol denoting the probable error of the quantity enclosed in the parenthesis. The results from the individual pairs, their weights, and the data upon which these weights depend are given in the following table. The reference number refers to the number of the pair in the observing list.

TABLE OF RESULTS AND WEIGHTS.

Ref. No.	$r(\delta_1)$	$r(\delta_2)$	Obsr. E. S. H.			Obsr. G. C. C.		
			Seconds of Lat.	$n$	$p$	Seconds of Lat.	$n$	$p$
1	$\pm 0''.20$	$\pm 0''.08$	[35'.49]	1	.....	37'.04	2	38
2	.10	.33	37.21	4	26	37.15	2	30
3	.09	.06	37.76	6	52	38.04	3	63
4	.15	.11	38.02	6	47	38.19	3	55
5	.25	.20	38.43	3	23	37.83	3	40
6	.40	.10	38.00	3	19	38.56	3	32
7	.18	.18	38.33	6	41	37.73	3	47
8	.16	.16	37.19	4	31	38.07	3	51
9	.20	.18	36.98	4	29	37.43	3	46
10	.25	.18	37.71	2	16	37.54	3	41
11	.13	.20	37.92	3	24	37.81	3	49



The probable errors of the declinations have been taken from Boss' catalogue, so far as possible; for the few stars not contained in Boss they have been estimated from analogy.

The resulting values of the latitudes are as follows:

$$\text{Obsr. E. S. H. } 43^{\circ} 4' 37''.77 \pm 0''.101$$

$$\text{G. C. C. } 43^{\circ} 4' 37''.79 \pm 0''.085$$

Applying to the mean of these results the reduction  $-0''.81$ , we have the zenith telescope latitude of the meridian circle of the Washburn Observatory:

$$43^{\circ} 4' 36''.96 \pm 0''.10. \text{ E. S. H.}$$

$$36.98 \pm 0.09. \text{ G. C. C.}$$

or, as the result of this method

$$43^{\circ} 4' 36''.97 \pm 0''.07$$

#### IV. DETERMINATION OF THE LATITUDE OF THE WASHBURN OBSERVATORY BY TRANSITS OF STARS OVER THE PRIME VERTICAL.

BY GEORGE C. COMSTOCK.

The following determination of the latitude of the Washburn Observatory was made during the months of August and September, 1884, with the 3-inch Fauth transit instrument described in vol. i of the *Publications* of this observatory. A diagonal eye-piece giving a power of 120 diameters was used in all the observations. For the purpose of practically testing the advantages of the observation of stars in the prime vertical by reflection, a considerable number of such observations was included in the working programme.

The transit instrument was mounted in the Students' Observatory upon a brick pier capped by a block of limestone 33x33x12 inches in size, which it was supposed, would furnish a sufficiently stable support for the mercury basin used for the reflex observations. Experience, however, showed that the tremors produced by passing vehicles and especially by trains upon a railroad track, distant about 1200 feet from the Observatory, were transmitted through the pier so as to entirely obliterate the reflected image of a star. This difficulty was considerably diminished, although not entirely overcome, by placing several folds of soft woolen cloth between the mercury basin and the pier. It seems worthy of note that the reflex observations were never interrupted by wind although the velocity of the wind was on one occasion as great as 25 miles an hour. Under favorable circumstances no difficulty was experienced in observing by reflection stars of the 6.5 mag. and on two or three occasions, reflex observations of stars of the 7 mag. were made in a bright field.

The equatorial intervals of the transit threads were measured with the micrometer of the instrument by Miss ALICE

LAMB, student in the Observatory. The adopted intervals with the notation of the threads are as follows:

A = +220'.59	C <sub>1</sub> = +43'.07	D <sub>1</sub> = - 88'.26
	C <sub>2</sub> = +21.55	D <sub>2</sub> = -110.43
B <sub>1</sub> = +132.13	C <sub>3</sub> = - 0.50	D <sub>3</sub> = -133.73
B <sub>2</sub> = +110.33	C <sub>4</sub> = -22.64	
B <sub>3</sub> = + 88.20	C <sub>5</sub> = -44.19	E = -220.65

The point in the field from which these distances are reckoned is the mean of the wires A, B<sub>2</sub>, C<sub>3</sub>, D<sub>2</sub>, and E. When the clamp is north an east star crosses the threads in the order A, B, C, D, E. This disposition of the threads is far from being a convenient one for reflex observations. In all such observations the telescope was first pointed at the mercury basin and the reflected image of the star was observed over from three to five threads. The telescope was then pointed to the heavens and the star observed over as many threads as possible, usually three to six. This required a somewhat hurried change of the pointing of the telescope, which, in several cases, caused one end of the axis to roll up on its wye, entirely vitiating the observation. Had the groups A and E consisted of five wires each, instead of one, this difficulty would have been avoided and the quality of the observations considerably improved.

All of the observed transits were recorded upon a chronograph.

The inclination of the axis of the instrument was determined upon each night by numerous readings of the striding level, usually three reversals before and three after each latitude star not observed by reflection, and one to four reversals with each star observed for instrumental constants.

The correction for inequality of pivots was provisionally assumed to be -0".45 for clamp N.

The construction of the transit instrument employed does not permit reflex observations to be made at a smaller zenith distance than 18°. This zenith distance on the prime vertical in this latitude corresponds to an hour-

angle of  $1^h 36^m$ ; hence if any considerable number of stars were observed by reflection at their transits over both verticals, a night's work would need to be unduly prolonged. To avoid this, the observing list was so selected that the first part, extending from  $17^h 13^m$  to  $19^h 46^m$ , sidereal time, consisted mainly of stars to be observed at their transits over the east vertical, and the second part, extending from  $19^h 55^m$  to  $23^h 19^m$ , comprised as many of the stars observed over the east vertical as crossed the west vertical during this period, and for each east star not observed upon the west vertical, another star, differing from the former in declination so little that the effect of an error in the assumed azimuth or collimation may be considered as eliminated from the mean result of the two stars. The instrument was reversed between the two parts of the observing list. Each part of this list also contained a few close circum-zenith stars, which were observed at their transits over each vertical in the same position of the instrument.

The latitude derived from a pair of stars, one observed east and the other west, will be affected by errors in both co-ordinates of each star, while the latitude derived from a transit of a single star over each vertical depends upon a single declination only. If the co-ordinates of the east and west stars respectively are distinguished by the subscripts 1 and 2, the effect of errors in the star places upon the latitude will be given by the equation,

$$\Delta \varphi = \frac{\sin 2\varphi}{\sin 2\delta} \cdot \frac{\Delta \delta_1 + \Delta \delta_2}{2} + \frac{1}{2} \sin 2\varphi \operatorname{tg} t \frac{\Delta \alpha_1 - \Delta \alpha_2}{2}$$

For the case of a single star observed at its transit over both verticals this, of course, becomes,

$$\Delta \varphi = \frac{\sin 2\varphi}{\sin 2\delta} \Delta \delta.$$

If for the unknown, actual error of a stars place we substitute the probable error of a place derived from any given authority, we shall obtain a measure of the relative effect of errors in the catalogue places upon a latitude derived from two stars and from a transit of the same star over each ver-

tical. Denoting the probable error of any quantity, as  $\varphi$ , by the symbol  $r(\varphi)$  we have for one star and two stars, respectively

$$r_1(\varphi) = \frac{\sin 2\varphi}{\sin 2\delta} r(\delta).$$

$$r_2(\varphi) = \sqrt{\frac{1}{4} \frac{\sin 2\varphi^2}{\sin 2\delta^2} \left\{ \overline{r(\delta_1)^2} + \overline{r(\delta_2)^2} \right\} + \frac{1}{16} \sin 2\varphi^2 \operatorname{tg} t^2 \left\{ \overline{r(\alpha_1)^2} + \overline{r(\alpha_2)^2} \right\}}$$

Put  $r(\alpha) = k r(\delta)$ , in which  $k$  is an unknown constant, then the second equation reduces to

$$r_2(\varphi) = \frac{1}{2} \sin 2\varphi \sqrt{\frac{2}{\sin 2\delta^2} + \frac{\operatorname{tg} t^2}{2} k^2} \cdot r(\delta).$$

the several values of  $r(\delta)$  being assumed equal. In order that  $r_2(\varphi)$  may equal  $r_1(\varphi)$  the quantity  $k$  must be determined so as to satisfy the equation.

$$\frac{1}{\sin 2\delta} = \frac{1}{2} \sqrt{\frac{2}{\sin 2\delta^2} + \frac{\operatorname{tg} t^2}{2} k^2} \quad \text{or}$$

$$k = \frac{4}{\sin 2\delta \operatorname{tg} t}$$

The divisor  $\sin 2\delta \operatorname{tg} t$  will, in practice, always be less than unity, and as for any catalogue of precision we may assume  $r(\alpha) < 4 r(\delta)$  it appears that, in general, errors in the star places will have less effect upon a latitude determined from two stars than upon one determined from a single star.

The azimuth and collimation constants of the instrument were determined upon each night by observing in each position of the axis from two to five fundamental stars which crossed the prime vertical at zenith distances greater than  $60^\circ$ . The following values of the instrumental constants thus determined show that the instrument was fairly stable during the whole series of observations. On September 1 the instrument was adjusted in level and the inclination of the axis reduced from  $+20''$  to  $0''$ . The quantity  $\psi$  is the hour angle of the north end of the axis, reckoned from the meridian below the pole.

TABLE OF INSTRUMENTAL CONSTANTS.

DATE, 1884.		c.	BEFORE REVERSAL.		AFTER REVERSAL.	
			$\psi$	CL	$\psi$	CL
August	14.....	+0.03	+1.05	N.	+1.23	S.
	15.....	+0.05	+1.33	S.	+1.15	N.
	18.....	.....	+1.69	N.	+1.55	S.
	19.....	+0.05	+1.71	S.	+1.79	N.
	23.....	+0.05	+1.70	N.	+1.89	S.
	26.....	+0.10	+1.29	N.	+1.39	S.
	31.....	+0.07	+1.70	S.	+1.61	N.
September	4.....	+0.07	+1.13	N.	+1.16	S.
	5.....	+0.05	+1.23	S.	+1.18	N.

A constant collimation = + 0".059 = + 0".88 was used in the reduction of the whole series of observations. The quantity  $\psi + \Delta t$  was determined on each night from the stars observed for instrumental constants. The values of  $\psi$  above given are obtained by combining with  $\psi + \Delta t$ , the clock correction,  $\Delta t$ , which was simultaneously observed with the meridian circle, on August 26 by MILTON UPDEGRAFF, assistant in the Observatory, and on each other night by Prof. E. S. HOLDEN. This change in observers perhaps furnishes an explanation of the anomalous value of  $\psi$  on August 26. The values of  $\psi + \Delta t$  determined upon each night have been used in the reduction of that night's work.

The reductions were made by the formulæ contained in Vol. ii. of the *Publications of the Washburn Observatory*, (see also *Astr. Nachr.*, No. 2565) slightly modified to meet the requirements of the present case. The elimination of the inclination of the axis by reflex observations is there effected upon the assumption that an equal number of threads are observed direct and reflex, but in practice the number of threads of each class is frequently unequal and it becomes necessary to adapt the formulæ to this more general case. Adopting the notation of the article above cited, put

$$T_0 - \frac{1}{n} \Sigma T. \tau - T_0 + \Delta t - \alpha. \quad h = T - T_0$$

$$\sigma = \cot \tau \frac{1}{n} \Sigma \frac{2 \sin^{\frac{1}{2}} h}{\sin 1'}$$

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$$s = \tau + \psi + \sigma.$$

Then

$$\sin (\varphi - \delta) = \sin \varphi \cos \delta (1 - \cos \vartheta) + \sin b \cdot \frac{1}{n} \sum \cos z - \frac{1}{n} \sum \sin c.$$

If we distinguish between reflex and direct observations, denoting them respectively by the subscripts 1 and 2, we shall have

$$\sin (\varphi - \delta) = \sin \varphi \cos \delta \left\{ 1 - \frac{1}{2}(\cos \vartheta_1 + \cos \vartheta_2) \right\} + \sin b \frac{1}{2} \left\{ \frac{1}{n_1} \sum \cos z_1 + \frac{1}{n_2} \sum \cos z_2 \right\} - \frac{1}{2} \left\{ \frac{1}{n_1} \sum \sin c_1 + \frac{1}{n_2} \sum \sin c_2 \right\}$$

in which the term involving  $\sin b$  will be quite insensible for any ordinary adjustment of a transit instrument.

Put

$$\frac{1}{2}(\cos \vartheta_1 + \cos \vartheta_2) = \cos \chi.$$

$$\eta = \cot \tau \left\{ \frac{2 \sin^2 \frac{1}{2}(T_1 - T_2)}{\sin 1''} + \frac{1}{2n_1} \sum \frac{2 \sin^2 \frac{1}{2} h_1}{\sin 1''} + \frac{1}{2n_2} \sum \frac{2 \sin^2 \frac{1}{2} h_2}{\sin 1''} \right\}$$

and the formulæ for the reduction of the observations become:

$$\chi = \frac{1}{2}(T_1 + T_2) + (\Delta t + \psi) + \eta - \alpha.$$

$$\sin (\varphi - \delta) = \sin \varphi \cos \delta \frac{1}{2} \sin^2 \chi - \frac{1}{2} \left\{ \frac{1}{n_1} \sum \sin c_1 + \frac{1}{n_2} \sum \sin c_2 \right\}$$

The expression for  $\eta$ , although seemingly complicated, can be very easily computed by means of a table of values of  $\frac{2 \sin^2 \frac{1}{2} t}{\sin 1''}$ , as the separate terms are all very small.

The transits over each vertical were reduced separately by these formulæ and the mean of the resulting latitudes from transits of an east and west star is taken as a single result.

Each of these results, with the exception of those derived from the pairs of stars

Gr. 2533 E. and W.

Boss 449 E. and W.

74 Cygni, E. and Gr. 2415, W.

10 Lacertae E. and  $\alpha$  Lyrae, W.

is free from the effect of errors in the assumed collimation and thread intervals. The reversal of the axis could not be

so timed as to eliminate the collimation from these pairs. Boss 449 was observed but twice, once Cl. N. and once Cl. S.; its declination is not well determined and the results from it have been rejected. Each result from the other pairs has been corrected by half the difference between the mean results from that pair, observed Clamp N. and Clamp S.

The places of all observed stars which are contained in the *Berliner Astronomisches Jahrbuch für 1884* have been taken from that volume, the declinations of all other stars are from Boss's *Declinations of Fixed Stars*. To these latter declinations the systematic corrections contained in the supplement to the *Jahrbuch* for 1884 have been applied.

The following table contains the seconds of the individual results for latitude, including the uncorrected results from Boss 449:



TABLE OF INDIVIDUAL RESULTS FOR LATITUDE.

STAR.	Aug. 14.	Aug. 15.	Aug. 18.	Aug. 19.	Aug. 23.	Aug. 26.	Aug. 31.	Sept. 4.	Sept. 5.	Mean.
Gr. 2533.....	"	(38.0)	(37.6)	(37.2)	(37.8)	"	"	"	"	37.65
Boss 358.....	"	(37.2)	"	"	(37.3)	[37.2]	(37.6)	"	"	37.32
$\gamma$ Cygni.....	(38.2)	(37.5)	(37.3)	(38.6)	(37.3)	(37.9)	(37.5)	(39.2)	(38.1)	37.96
Boss 449.....	"	"	"	"	"	(39.0)	"	"	(38.9)	"
40 Cygni.....	"	38.0	"	[37.9]	"	[38.1]	[38.5]	"	"	38.12
$\gamma$ Cygni.....	37.9	"	38.0	38.3	[37.4]	37.9	37.3	38.2	37.4	37.80
Boss 423.....	"	"	"	"	"	37.7	38.4	"	38.4	38.17
$\tau$ Cygni; $\delta$ Herc.....	37.8	"	"	37.4	38.7	(37.8)	38.4	[38.4]	38.3	38.11
$\alpha$ Lyrae; 10 Lacertae..	37.3	37.2	38.1	37.6	37.1	37.3	37.9	37.1	36.9	37.39
74 Cygni; Gr. 2415...	[37.6]	(37.3)	[38.2]	(38.5)	[38.3]	[38.3]	(38.1)	[37.5]	[38.2]	38.00
Boss 376.....	"	(36.3)	(37.4)	37.4	36.9	38.0	37.6	[36.9]	"	37.21
Boss 414.....	"	"	"	"	"	(37.6)	(37.4)	"	38.4	37.80

Results from stars observed direct only, are enclosed in ( ). Results from stars observed direct and reflex at the transit over one vertical and direct only upon the other vertical are enclosed in [ ]. All other results are derived from stars observed both direct and reflex at their transits over each vertical.

Any discussion of the weights to be assigned to the separate determinations of  $\varphi$  contained in the preceding table in order to obtain from them the best value of the latitude which they are capable of yielding, must take into account two sources of error which affect the results given by any star or combination of stars, viz.: errors of observation and errors in the star places. That part of the probable error of a latitude which results from the probable error of the star places may be put in the form

$$\begin{aligned}\overline{r(\varphi)}^2 &= \left(\frac{d\varphi}{d\delta}\right)^2 \overline{r(\delta)}^2 + \left(\frac{d\varphi}{dt}\right)^2 \overline{r(\alpha)}^2 \\ &= \left\{\frac{\sin 2\varphi}{\sin 2\delta}\right\}^2 \overline{r(\delta)}^2 + \left\{\frac{\sin 2\varphi}{2 \cot t}\right\}^2 \overline{r(\alpha)}^2\end{aligned}$$

The probable errors of the declinations of most of the stars used may be obtained with sufficient accuracy from Boss's Catalogue, but no similar data are available for the probable errors of the right ascensions. For the present purpose therefore I assume  $r(\alpha) = r(\delta)$  and the above expression becomes with a sufficient degree of approximation

$$\overline{r(\varphi)}^2 = \left\{1 + \frac{1}{4}(\sin 2\delta \, tg \, t)^2\right\} \overline{r(\delta)}^2$$

or for the means of two stars

$$\overline{r(\varphi)}^2 = \frac{1}{4} \left\{1 + \frac{1}{4}(\sin 2\delta \, tg \, t)^2\right\} \left(\overline{r(\delta_1)}^2 + \overline{r(\delta_2)}^2\right)$$

The corresponding expression for the case in which a single star is observed both east and west, is, of course:

$$\overline{r(\varphi)}^2 = \overline{r(\delta)}^2$$

In the numerical application of these formulæ the values of  $r(\delta)$  were taken from Boss, for the epoch 1875. For the few stars not contained in Boss they were estimated from analogy. The probable error of an observed  $\varphi - \delta$  is readily obtained from a comparison *inter se* of the individual re-

sults from a single star or pair of stars. For the present I assume it to be  $\pm 0''.30$ . The expression for the weight,  $p$ , to be given to the mean of all the observations of a given pair of stars is, therefore,

$$p = \frac{m}{k \left( r(\delta_1)^2 + \frac{r(\delta_2)^2}{n} \right) + \frac{0''.86}{n}}$$

in which  $m$  is an arbitrary constant,  $n$ , the number of observations of the pair, and  $k$ , the coefficient  $1 + \frac{1}{4} (\sin 2\delta \operatorname{tg} t)^2$ .

The following table contains the weights used in combining the results, together with the data upon which they are based.

TABLE OF WEIGHTS.

Star.	$r(\delta)$	$n$ .	$k$ .	$p$ .
Gr. 2533.....	$\pm 0.20$	4	2	6
Boss 358.....	0.5	4	2	2
$\gamma$ Cygni.....	0.12	9	2	14
Boss 449.....	0.5	2	2	[1]
40 Cygni.....	0.18	4	2	6
$\gamma$ Cygni.....	0.09	8	2	16
Boss 423.....	0.13	3	2	6
{ $\gamma$ Cygni.....	0.14 }	7	1.11	8
{ 9 Hercules.....	0.23 }			
{ 10 Lacertæ.....	0.15 }	9	1.09	15
{ $\alpha$ Lyræ.....	0.06 }			
{ 74 Cygni.....	0.24 }	9	1.06	6
{ Gr. 2415.....	0.25 }			
Boss 376.....	0.41	7	2	3
Boss 414.....	0.24	3	2	4

Had these weights been computed before instead of after the observations were made, the working list might have been better arranged.

Combining the results by these weights, the resulting latitude is

$$\varphi = 43^\circ 4' 37''.80 \pm 0''.060.$$

The data here available are far from being sufficient to furnish any conclusive estimate of the advantage to be derived from reflex observations, but so far as they go they indicate an absence of any considerable systematic difference, in the present series of observations, between the

results of direct and reflex observations. If we combine, by the same weights as before, the results from those stars observed direct only and the results from those stars observed direct and reflex we find from Gr. 2533, Boss 358, and  $\gamma$  Cygni;

$\varphi=43^{\circ} 4' 37''.82$ .  $p=22$ . Direct. And from  $\gamma$  Cygni, Boss 423,  $\tau$  Cygni and  $\theta$  Herculis, and  $\alpha$  Lyrae and 10 Lacertae;  $\varphi=43^{\circ} 4' 37''.77$ .  $p=45$ . Direct and reflex. The difference of the two results being less than the probable error of either. The indiscriminate means of all the direct results and of all the results both direct and reflex, show a still closer agreement.

For determining the probable error of a single observed  $\varphi-\delta$  I have divided the stars into three classes and treated each class separately. These are:

Class I. Stars observed direct only.

" II. Stars observed direct and reflex.

" III. Pairs of stars observed direct and reflex.

The results from these classes are as follows:

Class.	No. of Stars.	No. of Obs.	Mean ( $\varphi-\delta$ )	p. e. of a single result.
I.....	3	17	2.1	0.28
II.....	2	11	3.0	0.26
III.....	2	14	5.1	0.30

So far as any conclusions can be drawn from these numbers they seem to indicate a small advantage for the reflex observations. This is especially noticeable in the comparison of classes I and III, the probable errors being almost identical, although the mean  $\varphi-\delta$  is in one case more than twice as great as in the other.

For the sake of comparison I have combined the individual results without regard to the probable errors of the star places, and find

$$\varphi = 43^{\circ} 4' 37.76 \pm 0''.046.$$

The probable error of a single result is  $\pm 0''.38$ . The corresponding probable error, using the instrument as a zenith telescope, was  $\pm 0''.38$ , an exact agreement. Assuming  $\pm 0''.28$

as the average value of the probable error of an observed  $\varphi - \delta$  we shall have

$$r(\delta) = \sqrt{(0.38)^2 - (0.28)^2} = \pm 0''.26.$$

which agrees well with the mean of the probable errors,  $\pm 0''.23$ , assigned to the declinations in computing the weights.

Adopting as the final result of this work the weighted mean of the results from the individual stars and applying to this the reduction  $-0''.81$ , the resulting latitude of the meridian circle of the Washburn Observatory is

$$\varphi = 43^\circ 4' 36''.99 \pm 0''.060.$$

V. A CATALOGUE OF 1001 SOUTHERN STARS FOR  
1850.0, FROM OBSERVATIONS BY SIGNOR P.  
TACCHINI, AT PALERMO, IN THE YEARS  
1867, 1868, 1869.

BY REV. FATHER HAGEN, S. J., AND EDWARD S. HOLDEN.

Through the admirable Vade-Mecum of M. HOUZEAU, I learned that a series of 2161 observations of 1001 stars between the declinations of  $-18^{\circ}0'$  and  $-29^{\circ}39'$  had been made by Signor P. TACCHINI with the PISTOR and MARTINS' Meridian-Circle at Palermo, in the years 1867, 68, 69, and published in the *Bullettino Meteorologico del R. Osservatorio di Palermo* from April, 1867, to July, 1869.

Professor TACCHINI was kind enough to procure for the Washburn Observatory a set of the *Bullettino* containing his observations; and subsequently, to give his consent to their reduction and publication here.

The *Bullettino* contains the apparent places with the epoch of the observations. Two, three or more observations are united in one mean, when the epochs are sufficiently near together.

The stars observed are from the 6th to the 9th magnitude and lie in the region covered by the Washington Zones. Each star had been observed on the average 2.16 times, and the observations appeared to be excellent. Rev. Father HAGEN, S. J., Professor of Astronomy at the College of the Sacred Heart, Prairie du Chien, Wisconsin, kindly undertook to reduce in his leisure moments these stars to 1850.0, the epoch of ARGELANDER'S Southern Zones, of the catalogue in Bonn Observations, vol. VI, and of the Washington Zones.

The observations have been compared with other catalogues here for the detection of various errors of print, etc. These are mentioned in the notes accompanying the catalogue. The systematic differences TACCHINI—YARNALL in R. A. and Dec. are given below. As most of the stars lie between  $-22^{\circ}$  and  $-26^{\circ}$ , no terms of the form  $(\Delta\alpha)_{\delta}$   $(\Delta\delta)_{\delta}$  have been deduced.

## COMPARISON OF THE POSITIONS OF TACCHINI'S AND YARNALL'S CATALOGUES.

HOUR	TACCHINI — YARNALL.				REMARKS.
	R. A.	No.	Dec.	No.	
0	.....	0	.....	0	
1	.....	0	.....	0	
2	<sup>s</sup> -0.146	5	<sup>"</sup> -1.80	5	
3	-0.050	4	+0.45	4	
4	+0.048	9	-1.23	9	
5	-0.147	3	-0.97	3	
6	.....	0	.....	0	
7	0.000	7	+0.14	7	
8	.....	0	.....	0	
9	.....	0	.....	0	
10	-0.137	6	-0.97	6	
11	+0.003	7	-0.20	7	
12	-0.108	8	-0.54	8	
13	-0.210	12	-0.33	12	
14	-0.026	8	-0.75	8	
15	-0.043	14	-0.06	14	
16	-0.040	49	-0.01	47	T. 284, 294 omitted in Dec.
17	-0.076	50	-0.75	50	T. 323 omit'd R. A. and Dec.
18	-0.060	36	-0.48	36	T. 406 omit'd R. A. and Dec.
19	-0.101	16	-0.71	16	T. 447 omit'd R. A. and Dec.
20	-0.018	16	-1.92	16	
21	-0.086	9	-1.01	10	T. 517 omitted R. A.
22	.....	0	.....	0	
23	.....	0	.....	0	

In many cases the same star appears under different numbers in the various partial catalogues of Signor TACCHINI. In such cases I have preferred to give the results of various years separately. I have also preserved the title "Catalogue of 1001 Stars," which was given to the original publication in the *Bullettino*.

A full description of the Palermo Meridian-Circle is given in the various numbers of the *Bullettino*, which have been referred to.

The transits were observed over nine wires whose equatorial intervals were determined by transits of *Polaris*. The observations were reduced by MAYER's formula.

$b$  was determined by the level usually,  $c$  by reversals on a distant mark,  $a$  and  $\Delta T$  from *Nautical Almanac* stars.  $a$  is subject to considerable variations,  $b$  and  $c$  are quite constant.

Four microscopes were read for the declinations. The pointings on the star were by a single fixed thread. The refraction is BESSEL's, and very frequent readings were made of the thermometer. The equator point was deduced from pointings on *Nautical Almanac* stars, and the system of this catalogue should be strictly that of the *Nautical Almanac* for the years 1867, 1868, 1869. The magnitudes are Professor TACCHINI's.

I desire to express my thanks to Professor SCHOENFELD who has kindly solved a number of doubtful cases by a reference to his unpublished *Durchmusterung*.



## CATALOGUE OF 1001 SOUTHERN STARS.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
1	9	1 59 32.98	25 23 43.7	756	1	68.946
2	8	1 59 34.78	24 17 4.6	757	1	68.995
3	7	2 4 26.71	18 27 6.1	758	1	68.995
4	7	2 4 28.52	19 41 5.0	759	1	68.946
5	8.5	2 9 19.41	23 44 25.8	760	1	68.946
6	8.5	2 9 36.06	21 49 4.0	761	1	68.995
7	5.5	2 15 0.72	18 20 51.1	762	1	68.946
8	9	2 15 24.99	25 53 3.9	763	1	68.995
9	6.5	2 19 36.70	20 43 28.5	764	1	68.946
10	8	2 21 34.24	27 6 22.5	765	1	68.995
11	6.5	2 26 44.81	20 39 40.7	766	1	68.995
12	8	2 29 25.37	22 1 9.7	767	1	68.946
13	7	2 31 40.19	21 6 21.2	768	1	68.995
*14	9	2 34 25.53	25 8 27.9	769	1	68.946
15	7.5	2 37 34.68	26 8 6.2	770	1	68.995
16	7	2 39 36.79	22 17 43.6	771	1	68.946
17	7.5	2 41 48.24	21 26 53.2	772	1	68.995
18	7	2 46 3.07	23 34 35.4	773	1	68.946
19	6.5	2 46 49.88	22 59 22.2	774	1	68.995
20	6	2 51 25.26	24 12 45.9	775	1	68.946
21	9	2 52 39.18	21 23 16.9	776	1	68.995
*22	8	2 57 0.54	21 57 3.0	777	1	68.946
23	9	2 57 50.86	21 59 46.5	778	1	68.995
24	8	2 59 56.37	19 21 27.7	779	1	69.017

14. Compare B. B. vi. and Cord Z. C. in R. A. [If the epoch were 68.995 the R. A. would be 25.<sup>s</sup>70. ].

22. B. B. vi. 2<sup>a</sup>, 102 should read, Dec. —21°56'59".6 according to a letter from Professor SCHOENFELD.

## CATALOGUE OF 1001 SOUTHERN STARS. — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
25	7.5	3 2 46.63	27 17 28.6	780	1	69.072
26	8	3 5 16.94	21 21 33.5	781	1	69.017
27	7	3 8 29.05	20 34 42.1	782	1	69.072
28	7	3 10 42.65	24 4 26.6	783	1	69.017
29	8	3 13 51.82	18 3 57.6	784	1	69.072
30	8.5	3 15 57.82	19 38 15.1	785	1	69.017
31	7.5	3 18 31.87	21 36 21.6	786	1	69.072
*32	8.5	3 21 3.44	20 20 24.0	787	1	69.017
33	7	3 24 1.82	18 58 49.0	788	1	69.072
34	7.5	3 25 58.77	25 7 38.7	789	1	69.017
35	7	3 29 41.81	19 52 34.8	790	1	69.072
*36	8-9	3 30 16.10	22 58 56.7	791	1	69.017
37	7.5	3 36 0.00	19 11 31.9	792	1	69.072
38	8	3 36 3.87	22 27 39.5	793	1	69.017
39	8	3 41 41.43	26 47 36.6	794	1	69.017
40	6	3 41 59.58	21 21 55.6	795	1	69.072
41	8	3 46 13.10	18 54 33.1	796	1	69.072
42	8	3 52 9.65	24 13 39.1	797	1	69.017
43	7.5	3 52 48.87	20 45 41.0	798	1	69.072
44	7.5	3 57 7.56	24 52 34.1	799	1	69.072
45	8.5	3 57 15.66	22 5 1.7	800	1	69.017
46	8	3 58 38.46	21 51 50.7	1	3	67.098
47	8	4 2 42.25	25 25 3.6	2	3	67.102
48	7.5	4 3 40.59	25 26 19.1	3	2	67.095
49	7	4 9 22.85	23 36 59.2	4	3	67.088
50	7.5	4 9 24.25	23 31 39.4	5	5	67.083

32. TACCHINI — B. B. vi. = + 0'.56; — 2'.8.

36. TACCHINI'S R. A. — 1<sup>m</sup>.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
*51	8.5	4 9 38.02 [4 9 37.59]	25 23 18.8 24 23 19.1]	6 6	1 1	67.094 67.094
52	6.5	4 15 17.79	26 5 6.7	7	6	67.096
*53	7.5	4 20 10.08	23 28 37.5	8	3	67.068
54	7.5	4 26 58.18	25 52 46.5	9	1	67.110
55	9	4 27 6.52	24 15 25.3	10	3	67.102
*56	7.5	4 30 55.98	23 21 15.3	11	1	67.061
57	7	4 32 45.56	26 0 17.4	12	1	67.080
58	9	4 33 41.52	22 54 40.1	13	4	67.104
59	7.5	4 42 30.78	23 32 20.6	14	3	67.108
60	7.5	4 42 51.78	23 19 36.7	15	3	67.068
61	7	4 53 16.12	22 37 34.0	16	3	67.066
62	7.5	4 53 47.44	25 16 58.4	17	3	67.084
63	7	4 56 25.07	23 0 50.3	18	1	67.110
64	7.5	5 3 28.57	22 41 14.1	19	3	67.066
65	7	5 4 38.81	26 6 3.2	20	3	67.084
66	8	5 7 38.14	23 10 2.6	21	3	67.108
*67	6.5	5 8 25.90	26 22 56.5	22	3	67.072
*68	7.5	5 9 26.14	23 3 59.3	23	1	67.130
*69	8.5	5 16 46.74	23 12 37.0	24	2	67.131
70	9.5	5 21 35.08	23 13 24.1	25	1	67.130
71	7.5	5 23 21.98	22 50 26.3	26	3	67.083
72	9	5 25 45.04	22 20 19.4	27	3	67.108
73	8	5 34 7.90	22 43 51.4	28	3	67.068
*74	8.5	5 38 32.26	22 34 24.2	29	3	67.116

51. If TACCHINI's position is corrected by  $+1^\circ$  the place in [ ] results.

53.  $T.-Y.=+0^s.38$ .

56. TACCHINI's position  $-1^\circ$ .

67. Lac. 1763. TACCHINI has been corrected by  $+20^\circ$ .

68. T's original  $-1^m$ .

69. Epoch  $+0.01$ ?

74. The star exists. SCHOENFELD.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800 +
75	7.5	5 39 38.95	23 12 6.0	30	4	67.069
76	6.5	5 40 0.56	23 42 25.3	31	3	67.097
77	7	5 45 12.34	22 58 4.9	32	3	67.066
78	8	5 47 2.93	22 24 26.5	33	2	67.143
79	7.5	5 56 45.60	23 13 17.1	34	3	67.066
80	7.5	6 0 35.90	23 4 46.0	35	3	67.093
81	8	6 3 22.34	22 5 44.4	525	2	68.180
*82	6.5	6 3 30.19	22 45 9.2	36	3	67.066
83	8.5	6 4 14.14	20 19 29.8	526	2	68.194
84	8.5	6 4 56.21	22 47 58.0	37	3	67.089
85	9	6 5 22.78	22 52 1.3	38	1	67.130
86	9	6 5 30.03	22 46 17.3	39	3	67.123
87	9	6 8 15.80	22 10 42.8	527	2	68.180
88	9	6 9 22.24	22 8 48.1	528	2	68.194
*89	6.5	6 10 45.09	22 39 19.9	40	3	67.121
90	7	6 10 49.13	22 19 22.6	41	5	67.090
91	8.5	6 14 49.56	22 16 36.7	529	2	68.180
92	9	6 15 13.32	22 8 18.7	42	4	67.125
93	9	6 15 57.95	22 10 46.3	530	2	68.194
94	8	6 16 9.43	22 31 42.2	43	3	67.084
*95	9	6 16 17.29	22 12 16.1	44	1	67.127
96	8	6 19 55.81	20 5 24.9	531	2	68.180
97	7	6 21 8.16	22 2 12.9	45	3	67.098
98	8	6 21 41.43	21 42 24.7	532	2	68.194
99	7	6 24 18.99	22 13 20.4	46	1	67.130

82. Proper motion in R. A. of about  $+0.^s006$ . B. B. vi; 6<sup>h</sup>, No. 9, should read in Dec. —  $22^{\circ} 45' 9''.7$ , according to a letter from Prof. SCHOENFELD.

89. Proper motions  $+0.^s007$  and  $-0''.26$  (STONE.)

95. TACCHINI's original has been corrected by  $-10^s$ .

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
100	8	6 26 7.82	20 54 55.8	533	2	68.180
101	8	6 26 51.66	22 30 1.6	47	3	67.110
102	8	6 26 59.69	22 57 25.9	534	2	68.194
*103	9	6 31 58.22	22 38 22.0	535	2	68.180
*104	8	6 34 1.53	21 15 15.9	536	2	68.194
105	8	6 39 17.92	22 42 2.0	537	1	68.176
106	8	6 39 31.27	20 37 12.7	538	1	68.193
107	8	6 44 26.52	20 44 14.0	539	2	68.194
108	8	6 45 34.29	22 7 37.4	48	3	67.096
109	8	6 46 15.56	21 0 19.9	540	2	68.180
110	8	6 46 29.75	22 52 4.5	49	3	67.173
111	9	6 46 39.89	22 55 47.9	50	1	67.157
112	8	6 51 7.10	20 51 4.3	541	1	68.193
113	8	6 51 16.76	22 57 40.2	51	3	67.096
114	7.5	6 55 22.76	23 17 25.4	52	3	67.117
*115	8	6 57 47.61	21 2 46.1	542	2	68.194
*116	8	7 0 4.57	23 11 56.6	801	1	69.100
117	6.5	7 1 6.33	23 36 35.6	53	3	67.127
118	7	7 1 51.26	18 22 11.4	802	1	69.105
119	7.5	7 1 53.85	20 37 29.0	803	1	69.119
120	6	7 5 13.34	20 38 15.5	804	2	69.098
*121	8	7 5 32.46	18 14 6.3	805	1	69.105
122	6.5	7 7 2.25	22 25 18.0	54	3	67.102

103. TACCHINI'S R. A. is  $0^s .5$  larger than AO $\epsilon_2$  5407 (1) Wash. M. C. Z.  
118.

104. TACCHINI'S epoch + 0.701.

115. AO $\epsilon_2$  6139 + 1 $^s$ ??

116. Compare Ll. 13835 and BB. vi.

121. Arg. Z. 278.65 is correct; AO $\epsilon_2$  6377—1 $^s$ ; according to a letter from Professor SCHOENFELD.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
123	6.5	7 7 27.70	22 39 10.7	806	2	69.115
124	8.5	7 7 43.28	18 10 48.5	807	2	69.123
125	7.5	7 8 0.28	19 44 8.5	808	2	69.130
126	9	7 8 28.85	19 44 11.9	809	1	69.135
127	8	7 9 30.84	21 1 31.4	543	1	68.193
128	6	7 10 17.36	23 3 9.7	810	1	69.105
129	7	7 10 19.09	23 2 57.7	811	2	69.098
130	8.5	7 11 5.44	21 10 18.3	55	2	67.126
131	6	7 12 26.88	19 0 34.1	812	2	69.115
132	8	7 12 55.51	21 46 31.2	813	2	69.120
133	8	7 13 14.46	19 41 56.6	814	2	69.130
134	7	7 13 35.24	20 25 45.1	815	2	69.137
135	9.5	7 15 14.69	20 7 53.8	816	2	69.098
136	7.5	7 15 52.38	20 13 27.0	544	2	68.194
137	8	7 16 22.29	21 12 6.5	56	3	67.148
138*	10	7 16 27.73	21 15 11.9	57	1	67.124
139*	8	7 16 52.54	19 56 40.3	818	1	69.105
140	8	7 17 20.07	19 54 17.7	819	2	69.115
141	7.5	7 17 41.97	21 18 47.3	58	1	67.138
142*	7	7 17 55.22	22 37 23.8	817	1	69.122
143*	6.5	7 17 55.29	22 37 26.2	820	1	69.119
144	8.5	7 18 33.19	20 52 2.1	821	2	69.130
145	6.5	7 18 39.38	20 52 56.3	822	1	69.138
146	8	7 20 17.11	22 47 5.2	823	2	69.098
147*	7.5	7 21 5.10	20 50 58.7	545	1	68.193
148	6.5	7 21 20.23	22 33 28.7	824	1	69.105

138.  $T - AO_{\odot} = +''$ . 82. TACCHINI to be corrected by  $-1'$ ?

139. TACCHINI'S D.C.  $-1'$ .

142. TACCHINI'S R. A.  $+ 2^m$ . See his No. 820. 143. See T. 817.

147. Proper Motion in Dec.? Compare  $AO_{\odot}$  6835 and L.L. 14567. Professor SCHOENFELD writes that  $AO_{\odot}$  6835 is correctly reduced.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
149	9	7 21 45.19	18 33 5.1	825	1	69.124
150	8.5	7 22 14.44	21 30 3.3	59	2	67.108
151	9	7 22 26.80	21 34 35.6	60	1	67.132
*152	7	7 22 28.00	18 34 10.9	829	1	69.113
*153	7	7 22 28.21	18 34 9.7	826	3	69.127
*154	9	7 22 43.71	21 31 34.4	61	1	67.157
*155	8.5	7 22 44.01	21 31 36.6	827	2	69.137
156	8	7 25 20.61	20 36 53.9	828	2	69.098
157	8.5	7 26 15.36	20 28 31.2	830	1	69.105
*158	9.5	7 27 8.49	23 8 47.2	831	2	69.128
159	7	7 28 5.10	20 58 56.0	832	2	69.137
160	7	7 30 30.99	21 3 45.1	833	2	69.098
161	8	7 30 38.57	19 57 47.3	834	2	69.119
162	6	7 32 3.59	25 1 38.7	835	1	69.105
163	7.5	7 32 23.53	19 55 55.5	836	1	69.113
164	8.5	7 32 57.79	25 6 21.2	62	5	67.128
165	6	7 33 37.26	19 19 5.5	837	3	69.137
166	8	7 33 44.18	24 22 48.3	63	1	67.141
167	7.5	7 35 32.77	23 16 15.6	838	2	69.123
168	9	7 36 26.14	21 24 20.1	839	1	69.100
169	9	7 37 5.09	20 55 37.6	840	1	69.105
170	7	7 37 24.17	25 8 57.5	841	2	69.115
171	6	7 38 15.91	24 19 1.3	842	2	69.137
*172	8	7 38 51.18	24 17 26.7	64	3	67.113

152. TACCHINI'S R. A. — 3<sup>m</sup>. See his No. 826. LL 14618. 153. See T. 829.

154. TACCHINI'S epoch + 0.<sup>f</sup>.02. Dec.—1'. See his No. 827.

158. Not identified in other Catalogues. See Mag.

172. See A Oe<sub>2</sub> and Cord. Z. C., which agree. 155. See T. 61.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
173	8.5	7 39 20.16	20 16 28.4	843	2	69.180
*174	7.5	7 39 31.84	23 53 40.0	4	65	67.172
175	7.5	7 39 40.11	22 46 42.5	546	2	68.194
176	8	7 40 13.11	20 28 1.3	844	2	69.098
177	8	7 40 23.67	22 50 4.7	845	2	69.123
178	8	7 42 6.86	21 38 15.5	846	1	69.105
179	8	7 42 34.19	24 35 34.9	847	2	69.115
180	8	7 44 14.86	21 40 40.6	66	4	67.118
181	7	7 44 40.09	24 8 57.3	848	2	69.134
182	7	7 45 14.41	20 20 18.9	849	2	69.098
183	7.5	7 47 13.5	22 55 35.5	850	1	69.105
184	7.5	7 47 14.71	22 48 1.1	851	2	69.115
185	8	7 49 13.94	23 39 53.9	67	3	67.161
186	8	7 49 30.00	23 44 28.9	68	1	67.154
187	8	7 50 57.89	18 44 29.3	852	2	69.098
188	9	7 51 39.62	20 11 50.5	853	2	69.123
189	8	7 52 25.74	18 55 46.7	854	1	69.105
190	8	7 52 32.18	19 56 45.6	855	2	69.115
191	9	7 54 43.58	24 37 19.8	69	3	67.129
192	8	7 55 51.64	19 54 11.0	856	2	69.098
*193	7.5	7 56 14.93	24 37 13.2	857	2	69.137
194	8	7 56 47.42	24 11 9.0	858	2	69.128
195	9	7 57 6.28	20 21 28.7	859	2	69.109
196	9	7 57 24.71	23 28 1.7	860	2	69.119
197	9	8 2 32.98	22 22 39.9	70	2	67.213
198	8.5	8 3 14.63	22 22 29.9	71	2	67.141

174. TACCHINI'S. Decl.  $-59^{\circ} 30'$  to make star agree with LL. 15176.

193. Small proper motion in R. A. in Dec.?



## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800 +
199	8	8 6 35.16	20 47 33.7	72	3	67.165
200	8.5	8 6 45.13	23 31 18.5	73	4	67.134
201	7.5	8 7 24.23	18 39 7.6	864	2	69.115
202	8	8 8 25.85	21 13 12.9	861	2	69.134
203	7.5	8 10 10.17	21 25 22.1	74	3	67.207
204	9	8 10 48.60	21 22 4.1	75	4	67.161
205	8.5	8 12 9.39	21 6 36.1	862	2	69.118
206	7	8 13 35.17	22 59 32.8	863	2	69.134
207	9	8 18 11.58	18 16 0.8	865	2	69.120
208	7.5	8 18 23.18	23 12 25.2	76	3	67.168
209	9	8 18 38.09	23 33 44.0	77	4	67.135
210	6	8 18 40.48	20 33 46.6	866	2	69.134
211	7.5	8 20 27.60	22 45 43.7	78	2	67.213
212	8	8 26 21.54	21 14 17.0	79	4	67.156
213	8	8 26 33.18	21 49 11.8	80	1	67.206
214	8	8 31 7.99	23 21 36.3	81	3	67.134
215	7	8 38 6.62	23 14 46.6	82	3	67.238
216	8	8 41 41.80	21 20 16.2	83	1	67.206
217	9	8 43 23.63	23 23 51.4	84	3	67.147
218	8	8 44 31.19	22 28 45.5	85	3	67.238
*219	9	8 50 8.53	21 56 50.1	86	1	67.146
*220	8	8 51 57.57	23 13 1.3	87	3	67.138
221	8	8 57 16.89	23 15 21.1	88	3	67.165
222	8	9 2 54.18	21 59 46.0	89	4	67.144
223	6.5	9 3 40.20	22 34 8.7	90	1	67.272
224	8	9 3 57.90	22 29 46.8	91	4	67.215

219. Ll. 17710. TACCHINI's Dec. probably  $-10''$ .220. Epoch possibly  $+0''.1?$

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
225	7.5	9 7 2.80	22 15 18.0	92	3	67.257
226	8	9 8 4.30	21 39 38.7	93	1	67.272
227	8	9 9 33.98	22 30 25.7	94	3	67.219
228	7	9 12 21.02	21 55 29.1	95	3	67.260
229	8	9 13 37.64	22 47 12.4	96	1	67.272
230	8	9 17 38.37	22 16 21.1	97	3	67.229
231	9	9 24 0.67	22 51 13.4	98	3	67.247
*232	8	9 24 41.33	22 50 50.5	99	1	67.261
233	8	9 25 46.11	22 15 12.4	100	3	67.210
234	7	9 28 34.01	22 1 4.8	101	3	67.247
235	8.5	9 32 3.25	22 17 27.3	102	3	67.210
236	8	9 35 17.24	23 1 35.2	103	3	67.260
237	8	9 41 39.54	21 59 6.8	104	3	67.257
*238	7	9 41 52.62	21 19 26.2	105	3	67.284
239	8	9 45 6.51	23 31 16.6	106	1	67.294
240	8	9 46 19.95	22 58 45.8	107	3	67.257
241	8	9 48 8.03	21 37 40.6	108	3	67.263
242	7.5	9 54 12.72	22 25 41.6	109	3	67.254
*243	7	9 54 47.65	23 5 12.8	110	3	67.300
244	8	9 56 10.05	20 12 24.9	547	2	68.250
245	7.5	9 57 18.41	21 50 4.2	111	3	67.263
246	7	10 0 3.37	20 31 34.5	548	2	68.257
247	8	10 2 7.91	22 49 57.1	112	3	67.308
248	9	10 2 42.63	20 56 29.1	549	1	68.310
249	8.5	10 4 48.82	21 53 36.6	113	3	67.263

232. TACCHINI — 1<sup>m</sup> to agree with AOe, 9810-11.235. TACCHINI — 1<sup>m</sup>, LL 19275.

243. AOe, 10298 requires a correction of +10'.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
250	8.5	10 4 52.27	20 32 41.6	550	2	68.250
251	8	10 6 49.75	22 20 23.6	114	3	67.300
252	7	10 9 38.83	19 55 23.2	551	2	68.309
253	7	10 10 31.43	23 7 44.8	115	2	67.290
254	8	10 10 45.95	20 16 37.8	552	2	68.250
255	8	10 11 46.44	22 25 54.9	553	2	68.257
256	7.5	10 13 8.63	22 21 3.5	554	1	68.269
257	7	10 14 25.19	22 57 28.6	555	2	68.309
*258	8.5	10 15 1.38	20 31 16.6	556	2	68.250
259	7	10 15 55.90	23 34 38.7	116	1	67.316
260	8	10 16 32.87	22 42 36.3	117	6	67.289
261	7.5	10 17 13.99	23 51 5.4	118	1	67.319
262	8	10 18 26.77	21 11 34.6	557	1	68.269
263	8	10 19 8.44	20 14 6.3	558	1	68.299
264	8.5	10 19 26.65	19 41 33.2	559	2	68.309
265	8.5	10 20 45.69	20 58 12.1	560	2	68.250
266	9	10 20 48.80	20 56 18.2	561	2	68.257
267	8.5	10 21 53.36	21 29 18.8	119	3	67.288
268	7.5	10 22 29.81	21 28 50.5	120	2	67.324
269	8.5	10 23 58.49	23 24 39.0	562	1	68.269
270	8	10 25 17.36	22 49 54.3	563	2	68.257
271	6	10 26 52.84	22 58 27.3	564	2	68.309
*272	8	10 27 31.65	21 25 48.1	565	2	68.250
273	6.5	10 27 49.33	22 24 14.0	566	2	68.302
274	7.5	10 29 40.42	21 53 17.7	567	1	68.270
275	8	10 30 26.27	19 31 11.3	568	2	68.344

258. TACCHINI—5\* to agree with AO<sub>3</sub>, 10568, and LL 20163 which Prof. SCHOENFELD writes should be corrected by  $-1^m$ .

272. TACCHINI's epoch has been corrected by  $-0^r .7$ .

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800 +
276	8	10 30 26.64	23 36 15.7	569	2	68.257
277	9	10 31 31.59	19 47 54.3	570	2	68.309
278	9	10 32 15.66	20 4 19.6	571	2	68.302
279	7.5	10 32 30.62	21 45 2.1	121	5	67.296
280	8	10 32 49.49	22 50 34.3	572	2	68.250
281	8.5	10 34 23.96	22 37 15.1	122	2	67.302
*282	8	10 35 6.86	19 49 10.7	573	1	68.269
283	7.5	10 35 40.59	22 45 56.5	123	1	67.319
284	7	10 37 17.04	23 12 1.9	124	3	67.307
285	9	10 38 36.35	20 11 2.0	574	2	68.250
286	8	10 38 55.99	22 38 41.1	125	3	67.285
287	7.5	10 39 11.50	18 58 22.2	575	2	68.314
288	8	10 40 36.51	19 33 2.4	576	2	68.302
289	8.5	10 41 2.74	20 23 6.9	577	1	68.270
290	8.5	10 43 57.85	20 43 48.5	578	4	68.284
*291	7	10 44 19.81	20 27 21.6	579	2	68.309
*292	7.5	10 45 47.33	19 49 20.6	580	2	68.302
293	8.5	10 46 49.58	22 22 55.7	126	3	67.285
294	8.5	10 47 9.05	19 26 13.3	581	1	68.270
295	9	10 47 50.10	22 7 35.5	127	3	67.307
296	6.5	10 47 52.42	19 52 0.5	582	2	68.315
297	9	10 48 50.37	22 5 4.0	128	3	67.326
298	8	10 49 34.14	21 14 1.0	583	2	68.250
299	7.5	10 50 36.85	21 13 12.3	129	2	67.347
300	8	10 54 22.89	19 15 10.1	584	2	68.302

282. Ll. 20682. See AOe 10820, R. A.

291. Ll. 20918. See AOe 10927, R. A.

292. Ll. 20953, AOe, 10950. Proper motion. Dr. DEICHMULLER observed it at Bonn. 1885, April 19, as follows: R. A. 1850;  $10^h 45^m 46^s.99$ , Dec. —  $19^\circ 49' 26''.1$ , according to a letter from Professor SCHENFELD.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
301	8	10 54 28.27	21 2 15.2	130	2	67.347
302	8.5	10 54 43.39	21 20 44.4	131	3	67.367
303	8.5	10 54 48.38	21 4 35.7	585	1	68.270
304	6	10 55 8.96	26 1 18.3	132	3	67.341
*305	11	10 56 38.42	22 6 11.9	133	4	67.312
306	8.5	10 57 10.50	20 19 4.1	586	2	68.250
307	8	10 58 27.33	19 35 56.8	587	2	68.309
*308	7.5	10 59 10.94	20 21 26.5	588	2	68.302
*309	7.5	11 0 48.20	20 42 29.6	589	2	68.309
310	8	11 1 14.59	21 20 55.8	134	3	67.285
311	8	11 1 41.80	19 42 7.1	590	2	68.315
312	9	11 2 48.09	22 1 50.5	135	4	67.312
313	8	11 4 29.37	19 20 3.7	591	2	68.302
314	7	11 5 10.98	20 56 4.8	592	1	68.270
315	7.5	11 6 18.62	22 11 1.7	136	4	67.342
316	9	11 7 39.31	18 47 21.9	593	1	68.332
317	7.5	11 7 51.76	18 49 16.5	594	2	68.315
318	7.5	11 8 19.70	22 5 57.9	595	1	68.248
319	8	11 8 49.89	19 52 20.3	596	2	68.309
320	8	11 10 3.06	19 56 54.2	597	2	68.302
321	8	11 10 22.08	21 19 34.9	598	1	68.270
322	7	11 11 13.07	23 31 28.3	137	3	67.349
*323	9	11 12 56.51	19 51 18.1	599	1	68.332
324	8.5	11 13 28.37	23 23 25.7	138	2	67.356

305. ARGELANDER's magnitude is 9.0.

308. TACCHINI's Dec. +1°.

309. TACCHINI's epoch for .3009 read .3090.

323. R. A. Compare Ll. 21619; AO<sub>e</sub>, 11317.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
325	9.5	11 18 57.85	19 37 42.7	600	2	68.309
326	9.5	11 14 19.53	19 41 2.6	601	2	68.315
327	7.5	11 15 29.62	19 48 14.0	602	1	68.300
328	8.7	11 15 53.00	22 53 6.9	139	3	67.340
329	8	11 16 23.87	20 26 23.8	603	2	68.250
330	8	11 16 57.10	21 15 52.8	604	1	68.270
331	7.5	11 17 20.46	22 0 36.4	140	3	67.349
332	8	11 18 2.48	20 24 16.7	867	1	69.280
333	8.5	11 18 46.46	21 51 34.1	141	3	67.300
334	8	11 18 46.72	20 34 33.9	605	2	68.309
335	7	11 19 5.68	20 31 56.8	606	1	68.332
336	8	11 19 54.01	23 20 42.8	142	3	67.358
337	8	11 20 1.87	23 15 41.0	607	2	68.315
338	10	11 20 35.30	21 55 36.0	143	3	67.324
*339	8	11 20 55.95	23 0 2.1	144	3	67.341
*340	8	11 20 55.95	23 0 1.9	608	2	68.250
341	8.5	11 22 14.10	20 30 47.9	609	1	68.270
*342	9	11 22 36.53	25 43 28.6	145	3	67.349
343	8.5	11 23 58.64	20 9 0.9	610	2	68.302
344	6.5	11 24 18.06	19 57 2.4	611	2	68.309
345	7	11 25 28.86	23 36 59.9	146	3	67.358
346	8	11 26 6.03	19 43 6.1	868	2	69.289
347	8	11 26 18.24	22 37 27.0	612	1	68.332
348	8	11 27 39.91	19 43 43.1	613	2	68.315
349	7	11 29 15.80	23 36 31.5	614	2	68.302
350	8	11 29 23.33	20 8 8.6	615	2	68.309
*351	7	11 31 26.98	23 53 55.5	616	2	68.324

342. AO<sub>2</sub> 11493 requires a correction of — 1°.

351. See TACCHINI'S No. 869.

339. See T. 608.

340. See T. 144.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
*352	7	11 31 28.94	23 52 55.7	869	2	69.289
353	8	11 31 51.03	24 3 59.3	147	2	67.360
*354	9	11 34 16.02	21 49 17.3	617	2	68.302
*355	8	11 34 16.07	21 49 18.3	148	3	67.324
356	7	11 34 25.37	23 33 12.9	618	2	68.309
357	8.5	11 36 31.15	26 3 5.3	149	3	67.351
358	7	11 36 49.48	19 51 46.5	870	2	69.289
359	8	11 37 53.42	20 38 23.8	619	1	68.332
360	10	11 38 1.44	22 9 19.6	150	3	67.294
*361	8	11 38 35.96	24 2 21.8	620	2	68.315
*362	7.5	11 38 36.01	24 2 22.8	151	1	67.341
363	8	11 38 51.45	24 8 34.8	152	3	67.362
364	7.5	11 40 53.61	22 15 29.8	153	3	67.352
365	9.5	11 42 21.32	22 12 37.1	154	1	67.275
366	8	11 42 39.74	18 46 18.7	871	2	69.289
*367	8.5	11 43 23.38	21 33 54.3	155	3	67.324
*368	8.5	11 43 51.05	23 0 40.4	621	3	68.321
369	7	11 47 53.63	24 1 29.4	872	2	69.289
370	9.5	11 48 50.84	21 13 24.9	622	1	68.332
*371	7.5	11 49 39.41	21 42 4.7	156	3	67.333
*372	8	11 49 39.47	21 42 4.5	623	2	68.315

352. See TACCHINI's No. 616.

354. See TACCHINI's No. 148.

355. See TACCHINI's No. 617.

361. See TACCHINI's No. 151.

362. See TACCHINI's No. 620.

367. T—AOe<sub>2</sub> 11707 = -23°.7. ARGELANDER's original is clear and reductions correct. Star observed by Dr. DEICHMULLER at Bonn, 1835, April 18 and 19, as follows: R. A. 1850, 11<sup>h</sup> 43<sup>m</sup> 23<sup>s</sup>.47 (2) Dec. -21° 33' 55".2 (2). Communicated by Professor SCHOENFELD.

368. LL 22368 = AOe<sub>2</sub> 11710 = Cord. Z. C. 3106. Proper motion in R. A. Compare mags. also.

371. See TACCHINI's No. 623.

372. See TACCHINI's No. 156.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.			S. Dec. 1850.			TACCHINI'S Number.	No. Obs	Epoch 1800+
373	8.5	11	51	23.08	22	34	42.9	157	2	67.860
374	9	11	52	49.79	21	2	33.4	873	2	69.289
375	8	11	53	43.33	19	49	38.1	624	1	68.332
376	8	11	54	21.62	25	56	1.1	158	3	67.349
377	8.5	11	55	19.29	21	19	2.1	625	2	68.309
*378	8	11	56	31.57	21	32	7.2	626	2	68.315
*379	8	11	56	31.70	21	32	7.6	159	3	67.331
*380	7.5	11	58	34.56	21	57	41.7	627	1	68.332
*381	8	11	58	34.76	21	57	43.8	160	3	67.358
382	7.5	11	59	20.07	22	55	57.7	161	3	67.373
383	8	11	59	46.69	23	18	20.8	162	1	67.392
384	7.5	11	59	55.41	23	7	54.7	163	1	67.398
*385	6.5	12	3	20.57	22	46	2.1	164	3	67.373
386	7.5	12	4	6.66	19	5	39.6	874	2	69.289
387	7.5	12	6	59.61	23	56	23.9	165	4	67.398
388	7	12	8	1.10	22	31	6.2	166	3	67.373
389	9.5	12	8	12.15	21	40	2.3	167	3	67.332
390	8.5	12	8	13.93	25	43	47.6	168	4	67.353
391	9	12	9	15.53	25	8	31.7	875	2	69.289
392	9	12	12	17.93	24	43	53.4	169	3	67.392
393	8	12	13	2.22	21	29	39.3	170	3	67.338
394	9	12	14	12.46	25	4	52.4	171	3	67.374
395	8	12	15	1.95	24	52	11.1	172	3	67.409
396	7	12	17	25.82	25	9	21.6	876	1	69.333
397	7.5	12	17	46.89	25	58	43.2	174	5	67.851

378. See TACCHINI'S No. 159.

379. See TACCHINI'S No. 626.

380. See TACCHINI'S No. 160.

381. See TACCHINI'S No. 627.

385. The star is  $\beta$  Corvi. Proper motion of  $-0''.02$  in Dec. (STONE).



## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
398	9	12 17 52.07	24 6 9.0	173	3	67.895
399	8	12 19 14.61	21 33 36.7	175	3	67.838
400	7.5	12 19 49.99	23 53 45.0	176	3	67.878
401	8.5	12 20 4.97	24 50 3.6	177	3	67.409
*402	7.5	12 23 20.26	18 45 52.2	877	1	69.338
403	7.5	12 24 3.34	20 9 15.8	878	1	69.357
404	8.5	12 25 55.88	22 41 0.5	178	3	67.341
405	7	12 28 7.12	19 41 53.6	879	2	69.346
406	8	12 29 17.92	24 4 3.1	880	1	69.357
407	8	12 31 41.18	22 59 6.6	179	3	67.893
408	7.5	12 33 31.74	24 10 12.0	180	3	67.403
409	8	12 33 38.31	19 47 32.5	881	2	69.337
410	6.5	12 33 58.53	18 56 10.1	882	2	69.356
*411	9	12 35 56.36	24 13 9.7	181	3	67.412
412	8.5	12 37 47.67	24 9 20.7	182	3	67.373
413	8	12 39 31.42	20 38 37.2	883	2	69.337
414	7.5	12 39 55.05	24 11 41.6	884	2	69.355
415	9	12 40 22.32	23 58 42.6	183	4	67.394
416	8	12 44 35.40	22 19 9.7	184	3	67.374
417	9	12 45 43.53	22 17 36.7	185	3	67.393
418	9	12 45 59.58	24 56 16.1	186	3	67.403
*419	8	12 46 50.52	24 36 46.0	187	3	67.412
*420	8	12 46 50.77	24 36 45.6	885	2	69.355
*421	7.5	12 47 9.63	24 8 26.0	886	2	69.336

402. TACCHINI'S Dec. — 1', Ll. 23393. Compare Ll. and B. B. vi. R. A.

411. Ll. 23729.

419. See TACCHINI'S No. 885.

420. Small proper motion in Dec. See TACCHINI'S No. 187.

421. Star is Ll. 24048—50.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
422	8.5	12 48 41.85	23 38 15.4	188	3	67.378
423	8	12 50 16.28	24 21 13.1	189	3	67.395
*424	7.5	12 51 50.88 ?	19 28 48.7	887	2	69.337
*425	7.5	12 52 10.88	23 6 11.8	190	3	67.406
426	8	12 52 58.31	20 37 1.1	888	2	69.356
*427	8	12 53 13.76	19 58 3.7	889	1	69.360
428	8	12 55 51.90	23 42 41.1	191	6	67.383
429	7.5	12 57 33.53	21 15 53.1	890	2	69.336
430	8.5	12 59 3.47	19 20 13.0	891	2	69.356
431	6	13 3 30.19	25 45 9.3	892	2	69.336
432	8.5	13 3 46.54	23 46 13.1	893	2	69.356
433	7	13 6 20.27	23 29 20.0	192	3	67.420
434	8	13 6 47.71	23 3 24.5	193	3	67.406
435	8.5	13 9 18.64	20 44 41.2	894	2	69.336
436	9	13 10 7.89	24 43 48.2	194	3	67.393
437	8.5	13 10 47.63	24 43 14.5	895	2	69.356
438	8.5	13 11 12.69	23 49 44.1	195	3	67.420
439	8	13 11 23.53	24 52 21.1	196	3	67.406
440	8	13 12 23.91	20 5 20.3	896	1	69.360
441	7.5	13 14 15.48	25 3 15.3	897	2	69.337
442	7.5	13 16 2.73	24 20 42.4	898	2	69.356
443	6	13 19 45.91	25 37 19.2	899	2	69.337
*444	6.5	13 21 31.48	22 30 15.6	900	2	69.356
445	8	13 22 17.05	22 52 23.5	197	3	67.450
446	7	13 22 50.74	24 52 46.2	901	2	69.364

424. Ll. 24183. Compare TACCHINI'S R. A. with A O e<sub>1</sub>.

425. TACCHINI'S R. A. too small by 0s.3, 0s. 4?

427. B. B vi, 12<sup>h</sup>, No. 96 was observed over 4 wires, and is correctly reduced according to a letter of Professor SCHOENFELD'S. TACCHINI + 1s?

444. Var. R. HYDRÆ.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
*447	8.5	13 23 52.84	25 14 1.5	198	3	67.411
448	7	13 24 12.05	28 47 31.4	199	2	67.432
449	7.5	13 27 12.62	21 50 56.3	200	3	67.450
450	7.5	13 27 20.69	21 15 11.2	902	2	69.364
451	7.5	13 28 55.59	22 50 49.5	201	3	67.409
452	8.5	13 29 59.99	22 55 35.7	202	2	67.433
453	6.5	13 33 14.50	22 41 19.4	903	2	69.364
454	9	13 34 6.58	21 17 9.5	203	2	67.432
455	9.5	13 34 57.93	24 12 48.9	204	6	67.428
456	6	13 37 14.92	25 21 39.2	904	1	69.387
457	7	13 39 2.53	18 30 10.9	905	2	69.364
458	7.5	13 42 0.05	20 7 17.7	906	2	69.375
459	8	13 42 42.50	20 14 15.4	907	1	69.387
*460	8	13 45 33.59	20 28 35.6	908	2	69.364
461	8	13 45 42.08	22 48 6.5	205	2	67.436
462	8	13 46 49.76	22 55 39.9	206	3	67.447
463	8	13 48 15.17	18 29 40.9	909	2	69.375
*464	8	13 48 38.54	22 21 58.9	910	1	69.387
*465	8	13 48 38.75	22 21 55.1	207	1	67.453
466	6	13 51 36.24	24 16 34.9	911	2	69.364
467	9	13 51 41.05	22 41 44.9	208	3	67.447
468	6	13 53 51.43	26 42 9.7	912	2	69.375
469	7.5	13 54 17.05	19 4 58.2	913	2	69.391
470	9	13 54 55.87	24 3 42.4	209	3	67.435
*471	7	13 55 31.42 ?	21 41 52.0	914	2	69.364

447. TACCHINI'S R. A. too small by 0s. 6?

460. R. A. Compare B. B. vi.

464. See TACCHINI'S No. 207.

465. TACCHINI'S Dec. + 10'. Ll. 25632. See his No. 910.

471. R. A. compare A O<sub>2</sub> and Ll. 25795—6.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
472	7.5	13 56 43.84	21 54 2.2	210	1	67.453
473	8	13 57 44.28	24 1 15.8	211	3	67.447
474	9.5	13 59 39.06	21 28 25.3	212	3	67.435
475	7	14 0 43.77	18 31 44.1	915	2	69.375
476	8	14 0 50.36	21 49 32.9	213	3	67.469
*477	9	14 1 16.63	20 29 8.3	916	1	69.387
478	8.5	14 1 42.47	20 31 26.3	917	1	69.398
479	9	14 5 18.78	21 45 52.5	214	3	67.436
*480	8	14 5 41.52	19 30 6.6	918	2	69.375
481	7.5	14 6 30.26	20 21 41.1	919	2	69.391
482	8.5	14 6 44.02	21 51 41.8	215	3	67.447
483	7	14 9 8.20	19 15 53.7	920	2	69.401
484	8.5	14 11 25.89	20 10 53.7	921	2	69.375
485	8	14 12 4.73	23 48 52.7	216	3	67.486
486	8	14 12 31.23	18 38 31.9	922	2	69.391
487	6	14 14 27.51	27 3 48.2	923	2	69.401
*488	8	14 14 45.25 :	27 7 39.8	217	3	67.447
489	6.5	14 16 15.51	24 7 21.0	924	2	69.375
490	8	14 17 29.19	21 26 44.1	925	2	69.391
491	9	14 17 46.04	23 31 53.3	218	3	67.469
492	8	14 19 6.16	21 18 54.9	219	3	67.447
493	9.5	14 19 6.43	24 10 49.3	220	3	67.436
494	7.5	14 22 10.85	21 47 23.4	926	2	69.375
495	7.5	14 22 25.96	20 2 48.6	927	2	69.391
496	9	14 24 1.41	23 31 17.6	221	3	67.458
497	7.5	14 24 35.64	23 21 17.0	222	3	67.445

477. LL 25932. B. B. vi, 14<sup>b</sup>, No. 5, is correctly reduced according to a letter from Professor SCHOENFELD.

480. Proper motion? Compare LL 26048—9 and A O e, 13476.

488. TACCHINI'S R. A. too small. Compare LL 26261; B. B. vi; Cord. Z. C., 1038.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.			S. Dec. 1850.			TACCHINI'S Number.	No. Obs.	Epoch 1800+
498	8	14	25	46.18	18	51	21.6	928	2	69.401
*499	7	14	27	37.53	21	31	7.2	929	2	69.375
500	8	14	28	32.52	21	29	2.3	223	1	67.475
501	7	14	30	22.22	22	39	34.7	224	3	67.436
502	7.5	14	30	42.99	24	22	35.8	225	4	67.449
503	6.5	14	30	57.22	25	4	17.3	930	2	69.391
504	8.5	14	31	21.35	21	1	19.0	931	2	69.401
505	7.5	14	32	33.97	21	58	15.5	226	3	67.476
506	9	14	34	4.99	20	32	58.5	932	1	69.387
507	9	14	36	10.36	23	14	19.5	933	2	69.401
508	8	14	37	10.91	21	46	23.8	227	3	67.479
509	6.5	14	37	30.76	22	30	53.9	934	2	69.375
510	7.5	14	37	54.96	21	46	2.8	228	2	67.490
511	8	14	47	50.48	23	38	51.4	229	3	67.455
*512	6.5	14	48	44.41	20	44	39.8	935	2	69.401
513	8	14	48	50.03	21	32	31.6	230	3	67.444
514	8	14	50	4.34	21	47	42.0	231	3	67.457
515	9	14	50	5.80	19	7	13.4	936	2	69.432
*516	9	14	51	18.84	21	23	33.0	232	3	67.487
517	8	14	56	36.21	22	25	31.9	233	3	67.445
518	8.5	14	57	7.17	22	23	0.3	234	3	67.455
519	7.5	14	57	30.05	22	44	11.1	235	3	67.476
520	8	14	58	31.74	23	36	41.0	236	3	67.487
521	7.5	15	0	11.59	22	19	15.4	237	2	67.509
522	9	15	2	25.83	21	30	11.1	238	3	67.462
523	7	15	3	41.46	18	32	6.7	937	2	69.432

499. Small proper motion in R. A. ?

512. The following and south star.

516. This star has proper motions of  $-0''.042$  and  $-0''.54$ , approximately.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
524	8	15 6 25.96	22 21 20.5	239	2	67.509
525	8	15 9 13.80	20 9 56.7	938	1	69.434
*526	9	15 12 51.26	21 47 54.3	939	1	69.398
527	8	15 13 29.31	24 55 2.9	240	2	67.509
528	8.5	15 13 59.32	22 21 27.9	241	3	67.467
*529	9	15 15 10.17	21 48 34.4	940	1	69.434
530	9	15 15 27.01	22 11 9.0	242	2	67.494
531	7.5	15 15 45.55	25 7 49.1	243	3	67.484
532	6.5	15 18 13.64	19 28 29.6	941	2	69.401
533	8	15 20 18.79	23 55 39.4	244	3	67.468
*534	9	15 20 49.13	18 54 16.1?	942	1	69.434
535	8.5	15 21 3.10	23 31 22.1	245	3	67.484
536	8	15 22 0.16	21 21 37.4	246	3	67.509
537	9	15 22 15.94	22 54 49.0	247	2	67.494
538	7	15 22 18.53	23 8 13.3	248	3	67.528
539	7	15 23 26.57	21 27 5.2	249	1	67.535
540	8	15 26 10.14	23 38 53.5	250	3	67.468
541	9	15 26 30.05	20 30 1.7	943	1	69.434
542	8	15 27 43.89	23 29 34.6	251	3	67.484
543	8.5	15 27 46.82	23 33 30.5	252	2	67.494
544	7.5	15 29 55.85	22 33 12.1	253	3	67.528
545	8.5	15 31 0.29	22 58 30.2	254	3	67.468
546	6	15 31 25.20	23 19 33.1	944	2	69.432
547	8	15 33 3.29	22 47 4.9	255	3	67.498
548	8	15 33 4.53	23 48 46.2	256	3	67.484

526. TACCHINI'S R. A. + 1<sup>m</sup>.

529. R. A.? Dec.? Ll. 28013. Compare B. B. vi.

534. The star is not in the D. M<sub>2</sub> according to a letter from Professor SCHOENFELD. If TACCHINI is corrected by + 80" the position becomes R. A. 15<sup>h</sup> 20<sup>m</sup> 49<sup>s</sup>.13, Dec.—18° 52' 56".1, and the star is Ll. 28183.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
549	8	15 33 14.67	22 33 0.7	257	2	67.512
550	7.5	15 35 23.45	23 54 57.0	258	1	67.535
551	8	15 36 21.61	22 24 50.4	259	3	67.528
*552	7	15 36 46.49	18 37 49.7	628	2	68.506
*553	7.5	15 36 46.76	18 37 48.4	945	1	69.434
554	7	15 36 53.62	22 16 38.1	629	2	68.514
555	7.5	15 36 54.51	24 14 23.6	260	3	67.468
556	7	15 39 33.55	23 21 59.8	261	3	67.498
557	9.5	15 39 57.74	23 13 9.5	262	3	67.484
558	7	15 41 47.76	22 47 46.5	263	2	67.512
*559	7.5	15 42 15.85	22 9 58.4	630	2	68.506
*560	8.5	15 42 15.96	22 9 58.7	264	6	67.597
*561	7.5	15 42 16.10	22 9 57.9	946	1	69.434
562	8	15 42 46.47	20 7 45.7	631	2	68.514
563	6	15 44 36.53	24 52 29.9	632	2	68.520
564	7	15 45 39.66	24 47 41.4	265	2	67.538
565	10	15 46 5.17	23 20 23.3	266	3	67.488
566	8	15 47 2.41	25 29 27.3	267	3	67.504
567	8	15 47 37.48	20 19 52.7	947	1	69.434
568	8	15 47 54.79	22 44 30.7	268	4	67.523
*569	7	15 48 25.52	21 2 41.5	633	2	68.506
570	7	15 48 54.09	23 5 18.1	634	2	68.514
571	8	15 49 44.91	20 27 22.9	635	2	68.520
572	8	15 52 25.46	24 46 14.6	269	3	67.498
573	7.5	15 53 5.63	21 33 15.0	270	2	67.512

552. See TACCHINI'S No. 945.

553. See TACCHINI'S No. 628.

559. See TACCHINI'S Nos. 264 and 946.

560. See TACCHINI'S Nos. 630 and 946.

561. See TACCHINI'S Nos. 264 and 630.

569. TACCHINI'S R. A. + 9m. L.L. 28986.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
574	7.5	15 54 24.30	19 25 7.3	636	2	68.506
575	8.5	15 55 1.47	19 9 18.0	637	2	68.514
576	7.5	15 58 0.70	21 27 12.8	271	4	67.523
577	8.5	15 58 26.79	21 39 2.5	272	3	67.504
578	7	15 58 52.12	24 3 16.7	273	3	67.536
*579	8	15 59 41.05	29 51 13.9	639	1	68.532
580	8.5	15 59 48.40	20 21 10.0	638	2	68.506
581	8.5	16 0 28.32	22 46 32.2	640	2	68.514
582	8	16 0 30.12	22 32 54.9	274	2	67.544
583	8.5	16 0 38.08	19 3 15.6	641	2	68.521
584	7.5	16 1 9.44	24 10 55.0	275	2	67.553
585	8	16 1 27.88	21 45 26.9	276	2	67.559
586	8	16 1 30.03	22 42 24.4	277	1	67.565
587	6.5	16 4 51.73	21 0 44.7	642	2	68.506
588	8	16 5 3.28	23 23 13.1	278	2	67.544
589	7	16 5 39.99	20 43 14.9	643	2	68.520
590	7	16 5 59.90	18 8 48.8	644	2	68.514
591	7.5	16 6 0.04	21 59 43.9	279	2	67.555
592	8	16 7 5.17	19 41 38.7	645	2	68.525
593	7	16 7 25.93	23 54 10.0	280	2	67.550
594	8.5	16 7 39.84	18 13 3.3	646	2	68.534
595	7.5	16 9 30.79	22 54 2.7	281	2	67.564
596	6.5	16 10 20.61	19 50 50.7	647	2	68.506
*597	8.5	16 11 17.91	19 40 34.5	649	2	68.520
598	8	16 11 19.27	19 41 15.7	648	2	68.514
799	8	16 11 48.10	18 19 26.0	650	2	68.534

579. TACCHINI's original appt. R. A. —3s; original Dec. for 29° 15' 45".7 read 29° 54' 15".7. Star is B. B. vi, 16b, 109?

597. TACCHINI's epoch for .5290, read 5200.



## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
600	9	16 13 34.42	24 1 21.5	282	5	67.539
601	7.5	16 13 54.15	22 45 35.3	651	2	68.525
602	8.5	16 15 28.55	22 18 3.1	652	3	68.519
603	7.5	16 16 24.93	23 6 35.0	283	2	67.559
604	8	16 16 35.90	23 3 18.8	284	2	67.566
*605	7.5	16 18 20.66	21 46 18.7	653	2	68.534
606	7.5	16 19 7.24	25 6 50.1	654	2	68.525
607	8.5	16 20 59.96	18 20 11.3	655	2	68.520
608	6.5	16 21 5.84	24 46 48.3	656	2	68.506
609	9	16 23 35.61	20 25 31.5	657	2	68.514
610	8.5	16 24 47.69	23 58 3.2	285	2	67.517
611	7.5	16 29 20.37	22 35 2.7	286	2	67.517
612	8.5	16 29 29.79	23 49 27.1	287	2	67.544
613	7.5	16 29 48.53	29 37 14.9	288	2	67.550
614	8	16 29 50.82	18 31 11.4	658	2	68.506
615	7.5	16 30 47.02	28 38 18.1	660	2	68.514
*616	8	16 30 53.87	25 45 33.5	948	2	69.499
*617	8	16 30 54.09	25 45 34.4	289	3	67.536
618	9	16 30 58.47	26 9 7.4	290	2	67.555
619	8	16 31 0.01	26 1 14.8	661	2	68.520
620	7.5	16 31 44.28	20 6 39.2	662	2	68.525
621	9.5	16 32 12.06	23 1 39.1	291	2	67.564
*622	7	16 32 18.14	27 30 43.9	663	4	68.540
*623	7	16 32 18.27	27 30 44.5	949	2	69.491
624	9	16 32 21.51	24 6 22.6	292	2	67.570

605. Proper motions of  $-0^s.023$  and  $-0''.48$  approximately.

616. See TACCHINI's No. 289.

617. See TACCHINI's No. 948.

622. See TACCHINI's No. 949.

623. See TACCHINI's No. 663.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
625	7.5	16 34 36.15	26 31 1.1	293	2	67.544
626	8	16 34 40.51	22 26 49.3	659	2	68.506
627	8	16 35 19.34	22 14 11.0	294	2	67.550
628	7	16 35 37.44	28 13 29.9	664	2	68.514
629	7	16 36 7.51	22 54 0.6	295	2	67.577
630	8	16 36 9.96	28 33 27.6	665	2	68.526
631	7.5	16 36 33.30	26 21 59.4	666	2	68.520
632	6.5	16 37 40.60	25 15 1.1	667	2	68.534
633	8	16 38 7.09	19 49 16.9	668	2	68.544
634	8	16 38 42.09	23 41 57.6	296	2	67.555
635	7.5	16 39 7.05	24 15 12.9	297	2	67.564
*636	8.5	16 39 46.35	19 0 12.42	669	2	68.506
637	8	16 40 25.57	24 48 14.8	298	2	67.570
638	9	16 40 27.04	24 23 25.9	299	2	67.550
639	7	16 40 36.94	24 22 18.6	300	2	67.544
640	8	16 40 44.68	18 39 28.0	670	2	68.520
641	8	16 40 54.47	26 28 29.1	671	2	68.515
642	9.5	16 42 6.51	19 34 26.4	673	2	68.526
643	8	16 42 12.62	24 34 18.2	301	3	67.536
644	8	16 42 23.58	18 55 26.9	950	2	69.491
645	8	16 42 39.16	25 16 27.9	302	2	67.577
646	8.5	16 43 1.18	22 38 57.7	303	2	67.564
647	7.5	16 43 4.08	25 20 29.5	672	2	68.547
648	8.5	16 43 33.76	19 5 48.3	951	2	69.499
649	8.5	16 45 19.56	25 33 40.5	304	2	67.556
650	8.5	16 45 28.30	27 29 51.6	674	3	68.511
651	7	16 45 47.16	23 15 41.9	305	2	67.550

636. Ll. 30528. Compare AOe, 15974 (Dec.), which is correctly reduced according to a letter from Professor SCHOENFELD. Proper motion? ?

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
652	8	16 46 20.32	18 38 4.7	675	2	68.520
653	8	16 46 32.23	25 17 11.1	306	2	67.544
654	7	16 46 36.31	21 19 18.1	676	2	68.526
655	6	16 47 45.55	22 54 24.4	677	2	68.534
656	7	16 48 15.29	19 17 49.4	952	2	69.491
657	8	16 48 33.08	27 22 11.5	678	2	68.545
658	8	16 49 2.00	25 49 15.4	307	2	67.570
659	8	16 49 40.85	23 45 1.1	308	2	67.577
660	9	16 49 47.32	23 30 24.9	953	2	69.499
661	6	16 50 46.80	24 51 33.6	679	2	68.506
662	6	16 50 58.61	24 45 17.2	680	2	68.520
663	7.5	16 51 33.55	21 13 41.9	309	2	67.544
664	8	16 51 59.20	27 1 21.7	310	3	67.551
665	9	16 52 7.19	26 24 54.0	681	2	68.515
666	8.5	16 52 25.40	26 43 29.8	682	2	68.526
667	9.5	16 52 38.18	18 42 20.3	683	2	68.534
668	9	16 52 51.19	24 50 2.5	311	2	67.560
669	9	16 53 5.11	23 3 45.4?	312	3	67.570
670	8	16 53 9.13	20 22 12.0	954	2	69.491
671	8	16 54 18.04	22 55 54.4	684	2	68.545
672	7.5	16 54 49.18	24 4 30.9	313	2	67.580
*673	8.5	16 56 21.89	24 20 59.9	955	2	69.577
674	8	16 56 29.03	28 39 39.2	956	2	69.499
675	7.5	16 56 46.54	21 4 5.1	686	2	68.526
676	8	16 56 47.72	26 22 9.1	685	2	68.520
677	7	16 57 14.46	21 21 7.4	687	2	68.515
678	6	16 57 35.89	26 18 14.8	957	2	69.491

673. TACCHINI'S Dec. +10'? ?

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
679	9	16 57 43.37	24 21 9.1	314	2	67.550
680	8	16 58 38.35	19 4 51.6	688	2	68.534
681	7.5	16 58 44.85	24 47 37.9	315	2	67.545
682	8	16 58 56.25	18 59 57.6	689	2	68.545
683	9	16 59 33.89	18 10 30.0	690	3	68.556
684	8	16 59 50.67	23 47 32.1	316	3	67.558
685	8	17 1 38.80	24 45 11.2	317	2	67.566
686	8.5	17 2 9.31	24 50 15.3	318	4	67.592
687	7	17 2 10.13	20 27 25.0	691	2	68.526
688	8	17 2 10.93	20 37 43.5	958	3	69.493
689	7.5	17 2 28.49	20 13 54.8	959	3	69.549
690	7.5	17 2 51.08	26 51 1.2	319	2	67.618
691	7.5	17 3 0.93	25 3 52.3	320	2	67.631
692	7	17 3 1.68	27 34 18.1	960	2	69.577
693	8	17 3 20.24	22 44 11.2	692	2	68.534
694	8.5	17 3 47.95	24 59 13.2	693	2	68.558
695	7	17 4 38.25	27 36 48.1	694	2	68.545
696	8	17 5 39.33	23 52 47.5	695	2	68.553
697	7.5	17 7 14.07	25 7 52.4	321	3	67.616
*698	7.5	17 7 25.06?	21 40 42.4?	961	2	69.572
699	8	17 8 3.40	27 35 46.4	322	2	67.615
*700	8.5	17 8 51.81	24 6 55.9	323	4	67.625
701	7.5	17 8 57.77	23 54 9.9	324	2	67.640
702	9	17 9 53.69	20 28 32.8	696	2	68.554
703	9	17 9 58.04	20 20 0.2	697	2	68.561
704	9	17 12 27.42	22 46 6.4	962	2	69.499
705	7	17 12 29.76	24 44 57.4	963	2	69.491

698. R. A.? Dec.? LL 31337. Compare AOe<sub>2</sub> and B. B. vi.

700. 39 Ophiuchi, north star. Mag.?

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
706	6.5	17 15 43.41	21 17 45.3	698	2	68.553
707	7	17 15 56.20	24 6 3.9	699	2	68.558
708	8	17 16 56.49	23 1 45.9	964	2	69.499
709	8.5	17 17 32.14	26 11 42.9	325	3	67.623
710	7	17 17 38.34	25 48 20.2	965	2	69.577
711	7.5	17 17 43.97	21 19 51.9	966	2	69.491
712	8.5	17 19 19.62	20 49 59.6	700	2	68.534
713	8	17 19 23.38	25 22 43.3	701	2	68.526
714	9	17 19 49.27	18 9 57.8	702	2	68.545
715	9	17 19 49.97	24 12 24.9	326	2	67.640
716	8	17 21 41.41	23 43 9.3	327	3	67.590
717	8.5	17 22 5.03	23 32 16.4	328	3	67.614
718	6	17 22 25.52	26 8 56.0	967	2	69.500
719	9	17 24 29.55	20 39 50.3	703	2	68.554
720	9	17 24 32.95	22 3 32.5	329	3	67.622
721	8	17 24 40.35	18 13 34.6	968	4	69.532
722	7.5	17 24 57.23	22 55 6.2	330	2	67.635
723	7.5	17 25 47.14	18 6 40.9	969	2	69.577
724	8	17 26 23.62	24 31 13.5	331	3	67.614
725	8.5	17 27 25.86	20 52 28.3	970	2	69.499
726	8.5	17 28 39.98	23 17 29.8	332	2	67.648
727	9	17 28 41.28	24 52 6.8	333	2	67.643
728	8	17 29 0.20	22 29 7.9	334	3	67.642
729	9.5	17 29 15.41	19 52 40.6	704	2	68.558
730	8	17 29 32.67	28 18 59.0	705	2	68.553
731	8	17 29 44.12	26 50 31.1	971	2	69.491
732	7.5	17 29 46.80	29 26 17.0	972	2	69.572
733	9.5	17 30 50.08	22 53 16.2	335	3	67.622

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800 +
734	8	17 30 52.82	28 50 3.5	973	2	69.577
735	8	17 31 40.89	23 44 59.7	336	3	67.614
736	10	17 32 30.85	18 33 22.2	706	2	68.545
737	8.5	17 32 43.39	26 45 46.6	337	3	67.601
738	8	17 33 13.92	23 16 13.8	338	3	67.655
739	8.5	17 33 38.35	20 1 26.5	707	2	68.526
740	7.5	17 33 51.09	27 48 23.1	339	2	67.646
741	6	17 34 26.48	21 36 16.6	708	2	68.534
742	8.5	17 34 37.14	26 13 51.1	340	2	67.635
743	7.5	17 35 9.10	23 36 16.8	341	2	67.640
744	7	17 35 21.28	22 7 16.3	709	2	68.553
745	9	17 35 39.97	21 57 4.0	710	2	68.558
746	7.5	17 36 38.92	26 54 17.2	342	3	67.614
*747	10	17 37 11.12	21 31 50.3	343	3	67.622
748	5	17 38 6.98	27 46 4.4	974	2	69.500
749	8.5	17 38 28.80	25 7 39.2	344	3	67.601
750	8	17 38 34.29	20 46 29.6	711	2	68.545
751	6.5	17 38 41.77	22 24 58.4	975	2	69.572
752	6.5	17 39 5.13	26 54 55.0	976	2	69.577
753	8	17 40 13.37	23 18 46.9	345	2	67.635
754	8.5	17 40 43.46	26 45 28.0	346	2	67.640
755	8	17 40 47.04	24 9 11.1	347	2	67.646
756	7.5	17 40 57.99	27 0 27.0	712	2	68.553
757	8.5	17 41 8.41	23 4 36.0	348	2	67.651
758	8	17 41 15.88	24 48 4.1	349	3	67.660
759	9	17 41 46.61	18 51 44.2	713	2	68.558
760	7.5	17 42 1.71	22 52 11.4	350	3	67.622

747. AOe, 17179 -10".

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
761	7.5	17 42 30.29	23 37 49.6	351	3	67.614
762	7.5	17 43 14.39	22 37 27.8	978	2	69.500
763	8	17 43 15.78	20 1 59.4	977	2	69.491
*764	8.5	17 43 50.97	27 35 12.8	979	2	69.572
765	7.5	17 44 9.69	27 14 34.3	352	2	67.646
766	7.5	17 44 53.57	19 50 48.9	714	2	68.545
767	6.5	17 45 40.14	24 51 5.3	980	2	69.577
768	10	17 46 18.97	18 15 28.4	715	2	68.534
769	8	17 47 2.50	26 44 25.9	353	3	67.601
770	6.5	17 47 5.57	18 46 12.4	716	2	68.553
771	8	17 47 6.73	22 25 43.0	354	3	67.614
772	7	17 47 13.72	28 2 7.0	717	2	68.526
773	8.5	17 47 21.95	23 21 38.5	355	2	67.635
774	7	17 47 57.47	23 54 44.3	356	3	67.622
775	6	17 49 8.01	28 44 10.2	981	2	69.491
776	7.5	17 49 53.15	22 29 50.7	357	2	67.646
777	9	17 49 54.95	22 21 33.0	358	3	67.664
778	8.5	17 49 58.25	25 47 58.3	359	2	67.640
779	8.5	17 50 1.02	23 17 49.6	360	3	67.652
780	8.5	17 50 9.38	20 2 29.6	718	2	68.545
781	8	17 50 22.39	22 26 50.6	982	2	69.500
782	7.5	17 50 56.41	22 31 55.1	983	2	69.572
783	7.5	17 50 59.76	24 16 0.4	361	2	67.635
784	6.5	17 51 4.71	20 19 19.5	984	2	69.577
785	8.5	17 51 33.81	19 12 58.5	719	2	68.534
*786	8.5	17 51 49.96	24 8 26.6	363	2	67.613

764. LL 32604. AOe, 17309. — 1°. B. B. ii right.

786. TACCHINI — 1<sup>m</sup>.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
787	8.5	17 52 39.44	24 8 51.0	362	3	67.622
788	6.5	17 52 49.13	22 46 14.3	720	2	68.526
789	8	17 53 17.25	23 1 23.8	364	2	67.601
790	8.5	17 54 20.49	22 36 47.7	985	3	69.491
791	8	17 54 58.48	22 33 51.9	365	2	67.662
792	8.5	17 55 4.22	24 10 56.4	366	2	67.640
793	8.5	17 55 7.57	26 50 57.8	368	2	67.646
*794	8	17 55 8.49	22 30 2.7	367	1	67.655
795	8.5	17 55 8.99	19 27 23.8	721	2	68.545
796	9	17 55 11.15	19 48 28.6	986	2	69.500
797	7.5	17 55 31.11	25 36 25.1	369	2	67.651
798	7.5	17 55 58.46	24 24 3.8	370	4	67.629
799	9	17 56 22.67	21 40 16.0	722	2	68.534
*800	7.5	17 56 40.01	19 45 29.6	967	2	69.577
*801	7.5	17 56 40.21	19 45 28.1	723	2	68.561
802	8	17 56 53.34	24 12 3.8	371	2	67.617
803	9	17 57 3.05	19 42 50.9	724	2	68.554
804	9.5	17 57 18.71	24 9 58.6	372	2	67.614
805	8.5	17 57 51.02	21 30 49.0	988	2	69.572
806	8.5	17 58 51.08	25 21 44.4	373	2	67.601
807	8	17 59 7.67	27 52 42.7	374	2	67.673
808	7	17 59 37.35	25 29 19.8	375	2	67.689
809	8	17 59 55.96	26 7 17.9	376	2	67.695
810	8.5	17 59 58.96	18 59 28.2	989	2	69.500
811	8	18 0 7.28	24 0 17.8	725	2	68.545
812	7	18 1 47.29	25 47 11.0	726	2	68.564

794. Compare AOe, and B.B.vi.

800. See TACCHINI No. 723.

801. See TACCHINI No. 987.



## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.			S. Dec. 1850.			TACCHINI'S Number.	No. Obs.	Epoch 1800+
813	7	18	2	26.21	28	55	39.4	990	2	69.577
814	7.5	18	3	1.23	20	27	1.0	991	2	69.572
815	8	18	4	7.20	25	10	57.8	377	2	67.703
816	7	18	6	17.39	20	25	36.5	727	2	68.564
817	8	18	7	24.31	23	56	39.3	992	2	69.577
818	7.5	18	8	26.73	27	24	12.1	993	2	69.572
819	8	18	8	40.64	23	19	31.1	378	2	67.695
*820	8.5	18	8	51.25	22	20	24.9	379	2	67.673
821	8.5	18	8	53.46	22	23	31.9	380	3	67.669
822	8	18	10	4.81	26	22	40.2	381	3	67.655
823	9	18	10	14.33	22	47	31.0	382	2	67.646
824	8.5	18	10	47.56	23	22	15.4	383	2	67.640
825	8.5	18	11	35.51	19	54	2.7	728	2	68.558
826	8.5	18	11	37.93	20	16	26.0	729	2	68.553
827	7.5	18	11	53.26	26	8	45.8	384	2	67.695
828	8.5	18	12	8.79	19	43	0.7	730	2	68.564
829	7	18	12	30.57	28	29	33.4	994	2	69.577
830	8	18	12	54.92	22	5	6.3	385	2	67.704
*831	7.5	18	13	1.12	22	21	37.0	995	1	69.573
*832	8	18	13	1.32	22	21	39.7	386	2	67.712
833	8	18	13	7.04	22	18	9.7	996	1	69.571
*834	8.5	18	14	13.69	26	14	22.2	387	2	67.639
835	9	18	15	18.89	26	33	56.4	388	3	67.664
836	9	18	16	2.66	23	3	17.3	389	2	67.640
837	8.5	18	16	37.56	23	9	29.8	390	2	67.646
838	9	18	16	40.97	21	6	50.3	731	4	68.556

820. TACCHINI'S epoch — 0<sup>y</sup> 004.

831. See TACCHINI, No. 386.

832. See TACCHINI, No. 995.

834. TACCHINI'S epoch changed from 1867.6094 to 1867.6894. Ll. 33306.

## CATALOGUE OF 1001 SOUTHERN STARS—Continued.

No.	Mag.	R. A. 1850.			S. Dec. 1850.			TACCHINI'S Number.	No. Obs.	Epoch 1800+
889	9.5	18	17	24.77	23	25	32.0	997	1	69.579
*840	8.5	18	17	33.96	23	30	56.5	732	2	68.564
*841	8.5	18	17	34.08	23	30	59.9	391	2	67.695
842	9.6	18	18	44.29	26	50	28.2	998	2	69.572
843	8.5	18	18	52.23	24	38	53.8	392	2	67.700
844	7.5	18	19	1.08	23	5	11.2	393	2	67.709
845	8	18	19	41.98	25	7	51.7	394	3	67.718
846	7.5	18	20	6.60	25	20	49.1	395	2	67.690
847	9.5	18	20	26.94	25	38	11.9	396	3	67.675
848	8	18	21	3.18	25	38	37.2	397	3	67.664
849	8.5	18	21	34.14	21	50	49.3	733	2	68.558
850	8	18	21	48.47	24	59	17.5	398	2	67.646
851	9	18	22	0.54	21	37	17.8	734	2	68.553
852	7.5	18	22	30.76	18	59	57.2	735	2	68.564
853	8	18	22	52.04	27	19	15.6	999	2	69.577
854	8.5	18	22	53.39	26	35	32.5	399	2	67.640
855	10	18	23	28.21	22	23	42.5	400	2	67.695
856	7.5	18	23	42.56	22	14	15.0	1000	2	69.572
857	8	18	24	4.05	24	12	48.9	401	2	67.714
858	8.5	18	24	25.09	24	10	46.8	402	2	67.711
859	8.5	18	24	29.21	25	33	15.8	403	2	67.700
*860	8	18	24	37.18	24	13	47.5	404	2	67.689
861	7.5	18	25	22.04	24	19	54.1	405	3	67.675
862	7.5	18	26	24.01	20	57	8.2	736	2	68.553
863	8	18	26	58.69	19	40	0.5	737	2	68.553
*864	8	18	23	43.13 ?	23	27	40.9?	406	1	67.658
865	8	18	30	29.05	22	5	34.1	407	2	67.700

840. See T. 391. 841. See T. 732. 860. TACCHINI'S Dec. + 1°.

864. Y. 7878 is 43°.31 and 23° 31' 5".9. See also B. B. vi. and Cord. Z. C.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
866	8.5	18 31 37.35	28 23 13.4	738	2	68.564
867	7	18 35 36.03	25 9 23.8	408	2	67.700
868	7.5	18 36 39.48	27 39 1.8	409	2	67.695
*869	8	18 36 52.88	27 29 41.9	410	3	67.664
*870	9	18 36 53.11	27 29 40.2	739	2	68.564
871	7	18 37 9.65	19 45 27.1	740	2	68.553
872	9	18 37 55.63	22 26 48.9	411	2	67.673
873	9	18 38 32.57	27 14 33.8	412	2	67.690
874	7.5	18 38 58.36	20 25 52.5	1001	2	69.577
875	8	18 40 59.86	24 48 16.2	413	2	67.721
876	9	18 41 38.25	22 26 1.8	414	2	67.714
877	7.5	18 42 4.09	27 19 57.3	415	4	67.663
878	8	18 42 12.37	20 28 6.7	741	2	68.564
879	8.5	18 42 40.32	24 49 30.4	416	2	67.673
880	8.5	18 43 36.41	22 28 37.6	417	5	67.700
881	8	18 43 43.00	27 55 58.1	418	3	67.696
882	7	18 46 55.46	23 21 34.8	419	3	67.672
*883	8.5	18 47 29.04	23 19 59.5	420	3	67.660
*884	8	18 47 29.35	23 20 0.1	421	2	67.690
885	9.5	18 47 40.04	23 26 39.8	742	2	68.564
886	8.5	18 48 15.83	27 38 44.4	422	3	67.724
887	7.5	18 49 8.43	25 4 16.9	423	3	67.703
888	9	18 49 43.04	25 19 47.7	424	2	67.711

869. See TACCHINI'S No. 739.

870. See TACCHINI'S No. 410.

883. See TACCHINI'S No. 421.

884. See TACCHINI'S No. 420.

## CATALOGUE OF 1001 SOUTHERN STARS.—Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
*889	9	18 49 46.14 ?	26 23 20.7	425	2	67.717
890	8.5	18 52 24.98	26 12 40.9	426	2	67.690
891	7.5	18 52 35.01	22 54 5.4	427	3	67.674
892	6	18 53 16.41	25 2 56.5	743	2	68.564
893	7.5	18 55 10.78	23 6 41.2	428	2	67.725
894	7.5	18 55 33.00	25 26 50.7	429	3	67.696
895	9	18 55 49.81	24 53 7.3	430	2	67.705
896	8	18 56 26.91	24 53 43.1	431	2	67.711
897	8	18 56 57.77	27 30 32.9	432	2	67.717
898	7.5	18 57 56.77	22 43 20.5	433	2	67.690
899	8	18 58 4.96	24 44 58.3	434	2	67.663
900	8	18 58 48.99	27 3 46.9	435	3	67.675
901	7	18 59 4.34	24 53 11.5	436	2	67.740
902	8	18 59 28.50	23 58 10.3	744	2	68.597
903	7.5	18 59 35.14	25 18 36.2	437	2	67.752
904	8.5	19 0 30.55	23 25 28.5	438	2	67.725
905	8	19 1 51.93	24 25 26.3	439	3	67.690
906	9.5	19 2 12.26	27 18 59.6	440	3	67.706
907	9	19 3 29.11	25 54 50.4	441	3	67.715
908	10	19 3 58.54	26 7 21.5	442	2	67.696
909	9	19 4 15.16	19 44 0.1	745	2	68.597
910	8	19 4 37.68	22 48 48.0	443	2	67.740
911	8	19 5 9.61	22 18 37.5	444	1	67.754
912	8.5	19 9 27.34	26 20 20.7	746	2	68.597
913	8.5	19 10 44.99	22 27 17.9	445	3	67.744
914	8	19 11 34.15	24 28 40.9	446	1	67.754

889. TACCHINI's original appt. R. A. for 52s.01 read 52s.61?? If so, R. A. for 1850.0 is 18h 49m 46s.74 agreeing with Bonner Ecob. VI.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI's Number.	No. Obs.	Epoch 1800+
915	8	19 14 17.07	19 15 45.9	747	2	68.597
*916	8	19 16 14.57 ?	24 42 1.9	447	2	67.740
917	7.5	19 16 43.71	22 44 23.8	448	2	67.752
918	7.5	19 18 56.19	18 38 46.1	748	2	68.597
919	8	19 21 50.04	24 15 32.4	449	2	67.690
920	8.5	19 22 6.15	24 24 7.6	450	3	67.699
921	9	19 22 23.97	21 56 41.6	451	2	67.709
922	8.5	19 22 33.13	21 56 53.5	452	1	67.715
923	8.5	19 24 18.46	28 51 0.4	749	2	68.597
924	7	19 29 33.89	28 56 29.6	750	2	68.597
925	9	19 31 21.08	23 40 13.6	453	2	67.711
926	9	19 32 29.01	25 10 50.9	454	2	67.724
927	9	19 32 39.88	23 58 45.3	455	2	67.740
928	7.5	19 33 16.03	25 12 16.2	456	2	67.752
929	8.5	19 34 38.43	25 4 5.9	751	2	68.597
930	8.5	19 38 5.96	24 5 46.6	457	2	67.743
931	8	19 38 31.16	25 59 23.5	458	2	67.722
*932	9.5	19 38 58.11	26 15 43.2	459	1	67.756
933	6.5	19 39 49.55	29 9 14.4	752	2	68.597
934	9.5	19 40 55.40	24 5 19.9	460	1	67.734
935	8	19 44 1.34	25 50 29.3	462	2	67.722
*936	8	19 44 58.99	27 4 49.0	461	1	67.756
937	8.5	19 46 10.09	24 17 42.6	463	2	67.748
938	7	19 46 39.50	19 40 52.6	753	2	68.597
939	8	19 46 41.93	26 56 28.2	464	1	67.754
940	9	19 49 50.47	26 41 38.0	465	2	67.724

916. TACCHINI's R. A. + 1<sup>s</sup> ? Compare Y. 8292; AOe, 19510.932. TACCHINI's epoch + 0<sup>y</sup>.03 for his Nos. 459, 461, 463.936. TACCHINI's epoch + 0<sup>y</sup>.03. R. A. + 1<sup>m</sup>.

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
941	8	19 51 45.91	20 15 42.7	754	2	68.597
942	8	19 51 46.55	26 37 49.0	466	2	67.748
943	8.5	19 51 53.40	23 2 34.1	467	1	67.754
*944	7.5	19 56 2.33	27 13 59.4	468	1	67.756
945	8.5	19 57 23.99	23 47 39.9	755	2	68.597
946	8.5	19 57 44.06	22 5 53.3	469	2	67.748
947	8.5	19 58 42.24	24 18 34.8	470	1	67.754
948	8	19 59 34.50	24 1 4.2	471	2	67.785
949	8.5	20 2 39.21	22 23 29.6	472	2	67.815
950	8.5	20 3 44.93	23 53 1.0	473	3	67.789
951	8.5	20 3 46.93	23 14 55.1	474	2	67.810
952	8	20 9 58.68	24 21 27.2	475	2	67.791
953	7.5	20 10 46.04	25 41 19.1	476	2	67.785
954	8.5	20 11 26.19	25 40 40.1	477	3	67.814
955	8	20 15 26.33	23 57 15.9	478	2	67.791
956	9	20 16 46.29	22 8 37.4	479	2	67.785
957	8.5	20 17 17.19	25 25 51.9	480	2	67.810
958	7	20 19 1.23	26 5 50.7	481	2	67.815
*959	8.5	20 21 18.85	23 0 13.0 ?	482	2	67.791
960	8	20 23 26.14	23 39 23.4	483	2	67.810
961	8	20 23 23.34	23 39 52.2	484	2	67.785
962	8	20 24 44.84	23 44 10.5	485	2	67.815
963	8	20 26 55.01	24 53 12.5	486	2	67.791
964	8.5	20 28 47.20	24 53 28.1	487	2	67.785
965	7.5	20 28 56.06	25 37 39.3	488	2	67.810
966	7	20 29 11.79	24 44 51.1	489	2	67.815

944. TACCHINI'S epoch + 0<sup>y</sup>.03.

959. Dec. + 5' ??

## CATALOGUE OF 1001 SOUTHERN STARS. — Continued.

No.	Mag.	R. A. 1850.	S. Dec. 1850.	TACCHINI'S Number.	No. Obs.	Epoch 1800+
967	7.5	20 32 26.22	26 31 40.2	490	2	67.791
968	8.5	20 34 50.46	24 0 18.2	491	2	67.785
969	8.5	20 39 31.12	23 23 39.8	492	2	67.810
970	7.5	20 39 36.02	23 16 58.6	493	2	67.815
971	7.5	20 41 38.96	25 31 58.4	494	2	67.785
972	7.5	20 42 13.60	21 51 54.7	495	2	67.791
973	7.5	20 47 51.91	26 51 54.5	496	3	67.797
974	9	20 48 16.67	24 14 6.1	497	2	67.785
975	7.5	20 48 30.70	24 25 4.9	497	2	67.815
976	8.5	20 51 18.10	23 17 2.0	499	1	67.811
977	8	20 52 41.89	23 39 42.5	500	3	67.797
978	8.5	20 54 22.89	22 33 17.2	501	2	67.785
979	7.5	20 58 27.97	27 53 20.3	502	2	67.791
980	8	21 3 57.30	27 18 52.2	503	2	67.829
981	8.5	21 7 17.59	22 3 33.2	504	1	67.833
982	9	21 10 4.27	24 26 4.2	505	2	67.829
983	7	21 15 30.91	26 11 59.6	506	2	67.836
984	8	21 15 32.07	23 23 12.2	507	1	67.832
985	7.5	21 15 45.32	23 55 52.9	508	2	67.813
986	8.5	21 16 41.28	24 42 10.7	509	2	67.822
987	7.5	21 21 45.58	25 50 49.5	510	2	67.829
988	8	21 22 58.92	25 57 27.2	511	2	67.835
989	8	21 28 14.52	22 10 10.5	512	2	67.829
990	7.5	21 29 31.77	26 6 58.3	513	2	67.834
991	8	21 30 39.33	22 23 16.1	514	3	67.814
992	8	21 34 27.68	23 51 8.9	515	2	67.829
993	8	21 34 46.69	24 49 24.4	516	2	67.834

## CATALOGUE OF 1001 SOUTHERN STARS — Continued.

No.	Mag.	R. A. 1850.			S. Dec. 1850.			TACCHINI'S Number.	No. Obs.	Epoch 1800 +
*994	8	21	39	32.76?	26	34	10.4	517	2	67.834
995	9	21	39	38.50	24	24	56.4	518	2	67.829
996	9	21	45	21.59	26	28	53.9	519	2	67.834
997	8.5	21	46	59.45	23	59	46.6	520	2	67.829
998	8	21	52	15.54	24	0	42.4	521	2	67.835
999	8.5	21	52	42.71	25	43	36.9	522	2	67.829
1000	9	21	56	54.29	24	9	37.7	523	2	67.835
1001	7	21	58	53.09	22	58	18.5	524	2	67.829

994. TACCHINI'S original appt. R. A. for 34°.00 read 34°.40?? This gives R. A. 1850.0, 21<sup>h</sup> 39<sup>m</sup> 33<sup>s</sup>.16.





VI.—A LIST OF 437 SOUTHERN STARS FOR 1850.0  
DERIVED FROM WASHINGTON TRANSIT  
CIRCLE OBSERVATIONS, AND COMPARED  
WITH OBSERVATIONS AT THE CAPE OF  
GOOD HOPE, CORDOBA AND WITH YARNALL'S CATALOGUE.

BY REV. FATHER HAGEN, S. J., AND EDWARD S. HOLDEN.

In 1872 Professor HALL selected a list of 415 stars from the Washington Mural Zones which were observed on the Transit Circle as zero stars for an intended new reduction of these Zones. In 1882 I selected all observations of this list then in print in the Washington Observations, together with a few other Washington observations of south stars. Professor EASTMAN was kind enough to send me the observations of 1880 in Ms. The stars were reduced to 1850 by Rev. Father HAGEN; the corresponding C. G. H. stars (1880) were reduced to 1850 by Miss EMMA GATTIKER, one of my pupils; Mr. J. TATLOCK, Assistant, prepared the reductions to 1850 for the Cordoba Zone stars corresponding to the C. G. H. stars; these reductions have been checked and applied by Miss ALICE LAMB, student in Astronomy. I have added the positions from YARNALL's Catalogue, 1860. No account is taken of proper motions in the reductions. Stars known to have a considerable proper motion have their places inclosed in square brackets; [ ].

The comparisons are printed here, as they may be of further value in deducing the relations of the various systems adopted. All the known errata in the various authorities have been corrected before extracting the data.

## LIST OF 437 SOUTHERN STARS FOR 1850.

NUMBER.	WASHINGTON TRANSIT-CIRCLE.				YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.	
	R. A. 1850.		S. Dec. 1850.		Years.		R. A.		Dec.			
	h.	m. s.	°	' "			°	' "	°	' "		
1	0	5	39.41	38	39	29.6	73.74	39.35	26.2	26.5	26.9	
2	0	6	7.79	27	7	12.4	73.74	7.73	10.8	11.5	10.8	
3	0	8	33.62	32	16	48.4	73.73	33.11	48.5	33.30	44.7	
4	0	9	8.75	33	31	20.3	73	8.67	18.7	8.67	16.8	
5	0	20	28.98	33	50	14.8	73.80	28.84	9.5	28.76	10.6	
6	0	23	40.34	22	10	49.3	73	10.69	9.6	10.51	12.7	
7	0	25	10.70	26	11	12.1	73	15.45	9.5	15.35	8.6	
8	0	26	15.48	30	23	10.7	73	38.76	4.9	38.67	4.8	
9	0	26	35.36	31	8	58.0	73.74	38.76	4.9	38.67	4.8	
10	0	28	38.74	23	40	4.7	73.74	[39.38	36.0]	[41.00	37.2]	
11	[0	29	40.63	25	35	38.0]	73.74					
12	0	29	58.50	36	14	49.8	73.74					
13	0	30	41.94	28	26	50.4	74					
14	0	35	12.36	21	00	61.3	73	12.28	61.2	12.49	59.7	
15	0	53	17.39	20	53	62.3	73					
16	0	59	24.46	36	27	54.4	73	24.40	51.1	24.46	51.4	
17	1	20	48.30	22	48	62.0	73	48.25	59.5	48.22	59.4	
18	1	20	57.90	27	53	28.1	73	57.87	27.5	57.83	27.3	
19	1	38	37.38	25	48	17.1	73	37.29	16.2	37.42	16.4	
20	1	45	57.13	34	56	10.7	73					
21	1	48	19.70	26	6	21.0	73.74					
22	1	48	42.13	28	26	56.4	73.74					
23	1	49	46.01	29	36	27.7	73.74					
24	1	49	54.05	32	52	30.0	73.74			54.02	27.6	
25	1	51	49.35	33	47	54.0	73.74					
26	1	51	59.93	33	39	4.3	74	59.97	4.3	60.15	4.8	

27	1	52	0.48	23	39	8.3	73, 74	0.41	8.2	0.68	9.8	60.55	10.9
28	1	57	46.00	30	1	8.7	73	45.90	8.0	45.80	7.2	45.88	5.5
29	2	5	21.08	29	39	50.4	73	21.00	49.4				
30	2	6	17.95	31	25	47.2	73			18.03	46.7	18.15	44.5
31	2	7	1.18	34	2	27.0	73			1.10	24.6	1.27	22.2
32	2	12	3.68	27	8	2.1	73						
33	2	17	35.73	31	50.8		73	35.82	49.8	35.76	49.5	35.81	48.4
34	2	27	19.45	30	35	53.7	73			19.35	50.0	19.55	48.7
35	2	34	8.01	32	6	50.6	73						
36	2	43	24.35	28	33	63.7	73	24.33	61.8	24.33	60.6	24.30	58.9
37	2	44	6.40	23	38	60.9	73	6.35	59.8				
38	2	52	43.31	29	30	26.5	73			43.28		43.33	23.2
39	3	17	21.15	28	27	58.7	73	21.08	56.2	21.03	56.7	21.08	52.9
40	3	27	48.40	31	8	4.3	73	48.41	4.6	48.37	1.8	48.53	1.9
41	3	36	17.03	32	25	15.7	73	17.10	12.1	16.91	13.4	17.03	11.5
42	[3	40	23.07]	[23	41	61.1]	73	23.45	52.5	[23.36]	[61.8]	[23.62]	[57.1]
43	3	41	59.30	21	21	57.5	73, 74	59.51	56.9				
44	3	42	33.85	28	55	48.4	73						
45	3	54	41.78	30	51	60.1	73	41.70	59.1	41.70	57.5	41.81	57.5
46	3	56	32.02	27	54	19.8	73	31.92	17.2	31.99	18.9	32.01	17.8
47	4	9	12.14	29	17	56.3	73, 80						
48	4	9	13.00	29	19	27.4	73, 80						
49	[4	27	37.49]	[30	4	31.5]	73	[37.45]	[21.9]	[37.28]	[31.1]	[37.41]	[27.4]
50	4	29	43.05	30	52	24.5]	73	43.26	24.2	43.13	21.2	43.17	20.3
51	4	30	56.02	23	21	18.8	73						
52	4	40	26.55	28	21	43.4	73	26.49	42.5	26.46	43.2	26.48	43.7
53	4	44	28.92	27	21	41.8	73			28.82	40.2	28.87	39.1
54	4	49	50.14	27	56	45.6	73	50.17	42.2				
55	4	52	39.13	29	7	9.2	73, 74	38.95	8.3	38.95	9.2	39.13	8.2
56	5	28	5.47	29	57	20.7	73	5.42	19.4	5.37	18.2	5.58	16.8
57	5	31	50.64	31	9	14.8	73	50.55	14.4	50.59	14.2	50.73	11.3
58	5	32	0.09	29	1	46.1	73	0.13	46.1				
59	5	33	53.01	23	48	23.2	73						
60	5	36	28.70	50	36	42.2	73	28.67	40.8	28.56	39.4	28.78	37.5
61	5	41	13.14	28	41	51.5	73	13.08	47.4	13.11	49.6	13.10	47.8
62	5	43	12.58	28	25	48.8	73						

## LIST OF 437 SOUTHERN STARS FOR 1850.—Continued.

NUMBER	WASHINGTON TRANSIT-CIRCLE.			YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.				
	R. A. 1850.		S. Dec. 1850.	Years.	R. A.	Dec.	R. A.	Dec.	R. A.		Dec.			
	h.	m.	s.	°	'	"	s.	'	s.		'			
63	5	48	25.07	29	10	40.4	73	25.14	37.4	25.08	39.7	25.26	39.1	
64	5	50	32.23	26	32	53.5	73	.....	.....	.....	.....	.....	.....	
65	5	51	21.71	27	21	7.0	73	21.75	.....	21.56	6.1	21.73	4.3	
66	5	55	7.60	25	25	27.9	73	7.57	27.0	7.51	25.6	7.63	25.0	
67	6	17	37.66	31	42	60.7	76, 80	.....	.....	37.59	58.3	37.63	56.8	
68	6	18	26.07	27	56	51.2	73, 78	.....	.....	.....	.....	.....	.....	
69	6	29	8.24	29	58	35.2	73, 74	8.09	36.7	8.14	34.3	8.29	32.8	
70	6	30	17.60	28	42	54.9	74	17.50	56.9	17.44	54.1	17.61	51.5	
71	6	32	8.21	23	27	8.4	73	8.21	9.1	8.16	7.9	8.26	6.0	
72	6	33	57.79	30	19	[49.8]	73	57.97	[49.7]	57.90	[49.6]	58.10	[45.6]	$\mu' = - 0'.2$ approx.
73	6	37	15.36	29	5	30.4	73, 74	.....	.....	15.30	29.7	15.40	28.7	
74	6	38	52.75	27	11	62.0	73, 74	52.78	62.4	52.68	59.6	52.87	59.5	
75	6	51	42.97	27	20	25.3	73, 74	42.94	26.6	42.92	23.7	42.91	23.7	
76	7	2	17.45	26	9	31.2	73, 74	17.60	30.7	17.54	30.3	17.47	30.1	
77	7	9	32.83	30	25	38.8	74	32.80	38.4	32.72	37.5	33.13	36.0	
78	7	11	9.39	30	38	31.1	73, 80	9.46	28.0	.....	.....	.....	.....	
79	7	11	9.47	37	30	53.3	73, 80	9.44	53.7	9.34	50.5	.....	.....	
80	7	12	57.86	30	57	17.7	73, 74	57.94	17.4	.....	.....	.....	.....	
81	7	28	50.16	29	5	4.4	73, 74	50.18	2.6	.....	.....	.....	.....	
82	7	32	26.67	37	40	36.3	73, 74	.....	.....	26.75	32.6	26.91	31.6	
83	7	34	26.74	27	52	32.4	74	.....	.....	.....	.....	.....	.....	
84	7	37	47.24	28	35	57.9	73, 74	.....	.....	47.15	57.4	46.31	55.2	
85	7	46	5.44	31	15	14.6	73	.....	.....	.....	.....	.....	.....	
86	7	48	37.49	35	29	15.8	73	.....	.....	37.24	12.9	37.58	11.6	
87	7	51	41.39	29	56	3.8	73	41.49	3.8	41.19	3.1	41.30	2.0	
88	7	56	6.32	32	45	50.9	73, 80	.....	.....	.....	.....	.....	.....	
89	8	12	5.68	35	36	17.4	73, 74, 80	.....	.....	.....	.....	.....	.....	



## LIST OF 437 SOUTHERN STARS FOR 1850. —Continued.

NUM. P.	WASHINGTON TRANSIT-CIRCLE.				YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.	
	R. A. 1850.		S. D c. 1850.		Years.	R. A.	D c.	R. A.	Dec.	R. A.		Dec.
	h. m. s.	° ' "				s	"	s	"	s		"
126	10 29 40.20	26 52 50.9	73, 74	.....	.....	40.16	49.8	40.22	51.6	.....	.....	
127	10 30 53.22	34 56 33.3	74	.....	.....	.....	.....	.....	.....	.....	.....	
128	10 35 8.85	24 10 22.8	73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
129	10 36 14.74	26 30 49.8	73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
130	10 37 17.05	23 11 61.8	73, 74	17.02	61.1	.....	.....	.....	.....	.....	.....	
131	10 40 4.48	33 52 5.5	73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
132	10 45 31.80	25 47 2.6	73, 74	31.76	3.4	.....	.....	.....	.....	.....	.....	
133	10 47 0.69	35 39 37.3	72, 74	.....	.....	0.75	85.5	0.73	33.1	.....	.....	
134	10 56 7.52	31 9 13.4	73, 74	7.53	12.8	7.51	11.9	7.59	10.9	.....	.....	
135	11 2 46.08	21 47 40.0	72, 73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
136	11 10 25.55	33 55 7.7	72, 74	.....	.....	25.55	7.5	25.80	7.2	.....	.....	
137	11 11 22.65	32 56 3.3	74	.....	.....	.....	.....	.....	.....	.....	.....	
138	11 15 43.45	28 4 31.1	74	43.46	29.0	43.43	29.2	43.54	27.2	.....	.....	
139	11 21 7.94	31 1 54.6	73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
140	11 25 31.83	35 22 51.4	74, 80	31.93	49.3	31.78	49.1	31.71	48.4	.....	.....	
141	11 26 57.16	40 19 35.3	74, 80	57.04	34.2	.....	.....	.....	.....	.....	.....	
142	11 29 15.78	23 36 32.3	73, 74	.....	.....	15.78	31.4	15.81	29.2	.....	.....	
143	11 32 46.92	27 39 55.9	73, 74	.....	.....	.....	.....	.....	.....	.....	.....	
144	11 35 59.55	36 21 26.9	73, 74	.....	.....	59.58	25.7	.....	.....	.....	.....	
145	11 39 29.44	29 40 6.4	74	.....	.....	.....	.....	.....	.....	.....	.....	
146	11 41 11.01	25 54 59.7	74	10.96	58.3	10.92	57.5	11.00	56.2	.....	.....	
147	11 42 10.54	31 36 42.4	74	.....	.....	.....	.....	.....	.....	.....	.....	
148	11 45 14.12	37 30 20.5	74	14.19	18.4	.....	.....	.....	.....	.....	.....	
149	11 47 37.30	26 54 7.2	73, 74, 80	.....	.....	.....	.....	.....	.....	.....	.....	
150	11 49 27.21	32 28 50.0	72, 80	27.19	43.2	27.18	49.1	27.21	47.3	.....	.....	
151	11 54 33.18	29 46 15.9	72, 73	.....	.....	.....	.....	.....	.....	.....	.....	

152	12	3	8.36	27	13	54.5	72	.....	.....	8.29	58.5	8.33	53.4
153	12	9	5.23	25	45	46.8	72	.....	.....	.....	.....	.....	.....
154	12	19	84.87	27	53	6.2	72	34.93	6.8	34.76	6.8	34.99	7.5
155	12	22	26.88	22	51	59.8	72, 80	26.78	59.6	.....	.....	.....	.....
156	12	29	45.80	26	18	33.9	72	45.62	32.5	45.78	34.7	45.85	35.8
157	12	32	11.10	37	1	53.5	72	11.21	54.7	11.37	54.2	11.32	53.0
158	12	34	46.70	30	7	24.1	72, 73	.....	.....	.....	.....	.....	.....
159	12	35	8.08	35	11	18.9	80	7.99	18.9	.....	.....	.....	.....
160	12	35	16.51	24	10	2.4	72, 73	16.50	0.5	16.47	1.0	16.55	1.1
161	12	38	41.22	32	29	87.2	72, 73	41.10	87.8	41.17	38.1	41.22	35.7
162	12	42	9.35	25	1	20.1	72, 73	9.40	19.0	.....	.....	.....	.....
163	12	42	33.69	33	10	50.5	72, 73	.....	.....	33.62	49.2	33.64	47.7
164	12	43	36.60	31	13	40.2	72, 73	.....	.....	.....	.....	.....	.....
165	12	43	47.12	34	15	55.7	72, 73	.....	.....	.....	.....	.....	.....
166	12	49	42.98	38	6	19.5	72	.....	.....	47.00	54.5	47.46	52.9
167	13	0	43.88	32	41	57.8	72, 73, 80	.....	.....	43.14	17.7	43.32	16.4
168	13	3	30.25	25	45	9.9	72, 73	.....	.....	43.45	56.5	43.54	55.5
169	13	4	29.03	31	8	53.4	72, 73	30.36	9.2	30.34	9.2	30.30	7.8
170	13	6	20.84	27	44	21.7	73, 74	.....	.....	21.88	62.2	29.19	50.1
171	13	8	35.78	29	47	56.8	73, 74	35.86	53.7	35.67	53.9	35.89	54.9
172	13	13	14.44	34	6	31.8	73, 74	.....	.....	.....	.....	.....	.....
173	13	14	15.69	25	3	15.7	73, 74	15.86	14.9	15.66	14.5	15.80	14.5
174	13	16	21.07	33	30	20.7	73, 74	.....	.....	21.05	20.5	21.24	19.3
175	13	20	14.97	26	37	13.4	72, 80	15.11	13.7	14.99	11.0	15.09	11.3
176	13	21	45.47	36	8	20.5	72, 73, 74	.....	.....	.....	.....	.....	.....
177	13	24	15.31	27	55	5.1	72, 73	15.36	6.3	15.18	4.7	15.14	5.1
178	13	24	36.45	37	57	8.8	73	.....	.....	.....	.....	.....	.....
179	13	25	45.85	38	7	21.4	74, 80	.....	.....	.....	.....	.....	.....
180	13	26	25.43	36	47	5.4	74	25.22	5.1	.....	.....	.....	.....
181	13	27	16.54	31	36	13.3	73, 74	16.57	12.6	.....	.....	.....	.....
182	13	28	29.58	40	7	48.7	74	.....	.....	29.61	45.6	29.79	45.5
183	13	28	45.08	26	52	57.4	74	.....	.....	.....	.....	.....	.....
184	13	29	57.44	29	4	25.0	72	57.01	23.8	57.38	24.3	57.42	21.1
185	13	30	0.05	22	55	35.1	72, 73, 74	0.07	34.0	.....	.....	.....	.....
186	13	30	17.92	32	20	44.1	72, 74	17.92	42.4	17.80	45.0	17.91	44.8
187	13	30	53.68	33	58	59.3	72	.....	.....	53.52	53.6	53.82	53.8



LIST OF 437 SOUTHERN STARS FOR 1850.—Continued.

NUMBER	WASHINGTON TRANSIT-CIRCLE.				YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.
	R. A. 1850.	S. Dec. 1850.	Years.		R. A.	Dec.	R. A.	Dec.	R. A.	Dec.	
	h. m. s.	° ' "			° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	
188	13 33 10.74	32 50 11.2	72		10.72	13.7	10.70	12.2	10.80	11.4	
189	13 39 25.87	37 30 39.8	72		25.86	37.7					
190	13 40 16.92	34 56 53.1	72		17.05	51.3	16.80	53.3	17.02	51.5	
191	13 47 18.72	29 50 26.5	80		18.71	23.2	18.69	23.4	18.72	23.1	
192	13 48 45.50	27 53 57.3	72								
193	13 52 8.06	25 31 51.0	72		8.02	51.9	8.12	51.8	8.03	51.1	
194	13 52 12.79	36 44 20.1	72		12.62	20.8	12.70	21.6	12.75	19.4	
195	14 5 7.72	31 20 24.6	72				7.74	24.9	7.88	23.4	
196	14 7 46.36	34 18 31.0	72, 73, 89		46.22	28.4	46.24	27.9	46.34	28.1	
197	14 8 58.45	26 15 39.7	72, 73		58.59	37.9	58.25	38.8	59.91	38.4	
198	14 10 20.61	36 18 22.9	72, 73		20.62	25.0	20.57	24.6			
199	14 11 26.94	37 11 34.9	72, 73		26.97	34.4	26.99	32.4			
200	14 11 28.83	27 21 20.8	72, 73		28.87	20.8	28.87	19.9	28.99	19.7	
201	14 15 9.99	28 50 27.5	72, 73		9.98	27.4	10.05	26.1	10.19	27.0	
202	14 15 19.92	32 24 8.7	72, 73		19.99	7.4	20.04	6.2	20.10	6.5	
203	14 16 15.71	24 7 21.2	72, 73		15.76	20.1	15.63	21.1	15.69	21.2	
204	14 16 43.81	28 12 42.3	72, 73, 80				43.22	40.4	43.22	39.6	
205	14 17 32.95	39 11 37.3	72, 74				32.97	37.6	32.95	34.0	
206	14 20 23.76	28 26 23.6	72, 73		23.76	22.1	23.73	23.9	23.70	22.5	
207	14 20 53.25	25 20 24.9	72, 73		53.22	23.9	53.26	24.5	53.86	24.7	
208	14 23 23.03	27 2 16.8	72		23.12	16.7	22.96	18.1	23.13	17.2	
209	14 28 35.80	34 51 46.3	72								
210	14 30 13.65	58 54 46.0	72				13.71	45.5	13.81	43.0	
211	14 31 13.81	26 28 53.5	72, 73		13.83	53.2	13.85	51.8	13.94	52.6	
212	14 32 55.20	30 17 10.7	72				55.24	11.3	55.11	11.8	
213	14 37 27.10	31 2 51.9	72, 73								

[illegible]

## LIST OF 437 SOUTHERN STARS FOR 1850. — Continued.

NUMBER.	WASHINGTON TRANSIT-CIRCLE.				YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.
	R. A. 1850.		S. Dec. 1850.		Years.		R. A.		Dec.		
	h. m.	s.	°	'	"		s.	"	s.	"	
250	15	47	59.73	29	33	13.6	73, 4, 6, 80	...	...	...	{ This * has proper motions of — 0 <sup>s</sup> .028, and 1 — 0 <sup>s</sup> .43 ap- proximately.
251	15	51	56.67	26	37	8.9	74	...	...	...	
252	15	58	59.76	25	55	13.3	73, 74	...	...	13.1	
253	16	4	51.53	21	0	44.3	74	...	...	...	
254	16	9	0.61	27	40	2.8	73, 74	...	...	...	
255	16	11	37.07	23	48	11.0	74	...	...	...	
256	16	12	22.08	39	51	1.3	74	...	...	...	
257	16	18	7.13	28	56	39.5	74	...	...	...	
258	16	18	20.87	21	46	21.8	73, 74	...	...	...	
259	16	20	12.93	29	31	50.6	73, 74	...	...	...	
260	16	21	20.92	26	50	36.2	73, 74	...	...	...	
261	16	23	15.17	21	8	25.7	73, 74	...	...	...	
262	16	23	59.69	35	13	11.5	73, 74	...	...	...	
263	16	28	19.22	38	50	38.5	73, 74	...	...	...	
264	16	29	50.76	30	9	40.1	74	...	...	...	
265	16	33	39.81	37	51	55.3	73, 74	...	...	...	
266	16	33	51.91	26	9	60.0	73, 74	...	...	...	
267	16	34	40.75	22	26	49.9	74	...	...	...	
268	16	35	37.50	28	13	31.3	73, 74	...	...	...	
269	16	35	48.44	33	33	52.6	74, 76, 77	...	...	...	
270	16	38	7.22	19	49	17.7	74, 76, 77	...	...	...	
271	16	38	49.65	30	55	48.4	73, 74, 76	...	...	...	
272	16	39	7.24	24	15	12.2	74	...	...	...	
273	16	45	45.60	32	15	19.2	73	...	...	...	
274	16	47	45.60	22	54	28.2	73, 74	...	...	...	
275	16	52	49.42	36	38	17.0	73, 74	...	...	...	

276	17	11	44.14	31	25	24.2	74	1.13	51.4	11.06	38.2	5.33	36.3	1.5
277	17	12	1.51	20	56	53.9	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
278	17	13	59.87	23	25	12.3	75, 80	10.95	87.1	11.06	38.2	5.33	36.3	1.5
279	17	14	11.08	34	38	43.4	75, 80	10.95	87.1	11.06	38.2	5.33	36.3	1.5
280	17	14	37.66	21	33	60.1	73, 4, 5	10.95	87.1	11.06	38.2	5.33	36.3	1.5
281	17	15	5.41	34	33	3.1	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
282	17	16	41.91	27	27	27.7	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
283	17	20	34.13	37	10	14.0	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
284	17	21	54.37	33	34	55.1	73, 4, 5	10.95	87.1	11.06	38.2	5.33	36.3	1.5
285	17	22	16.03	23	50	31.6	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
286	17	22	24.63	31	25	49.9	74, 76	10.95	87.1	11.06	38.2	5.33	36.3	1.5
287	17	23	11.12	30	48	40.3	75, 6, 7	10.95	87.1	11.06	38.2	5.33	36.3	1.5
288	17	30	52.86	28	50	4.7	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
289	17	33	38.36	20	1	29.7	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
290	17	34	26.42	21	36	19.0	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
291	17	35	42.79	27	23	20.4	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
292	17	36	19.86	40	19	28.9	73, 4, 5	10.95	87.1	11.06	38.2	5.33	36.3	1.5
293	17	38	28.03	32	36	34.2	75, 77	10.95	87.1	11.06	38.2	5.33	36.3	1.5
294	17	38	34.51	20	46	30.4	74, 5, 6	10.95	87.1	11.06	38.2	5.33	36.3	1.5
295	17	39	1.99	38	55	35.4	75, 80	10.95	87.1	11.06	38.2	5.33	36.3	1.5
296	17	41	33.27	36	25	9.6	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
297	17	42	52.74	34	4	14.3	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
298	17	42	53.03	35	34	44.5	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
299	17	49	8.10	28	44	11.7	75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
300	17	58	35.00	28	28	7.6	73	10.95	87.1	11.06	38.2	5.33	36.3	1.5
301	18	2	26.35	28	55	41.5	73, 74	10.95	87.1	11.06	38.2	5.33	36.3	1.5
302	18	3	8.43	30	58	37.4	74, 75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
303	18	3	22.99	19	27	41.2	75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
304	18	4	21.61	29	34	7.8	73, 5, 6	10.95	87.1	11.06	38.2	5.33	36.3	1.5
305	18	4	47.62	21	5	33.3	75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
306	18	7	53.51	28	41	51.0	73, 4, 5	10.95	87.1	11.06	38.2	5.33	36.3	1.5
307	18	8	26.08	37	16	25.0	74, 5, 6	10.95	87.1	11.06	38.2	5.33	36.3	1.5
308	18	9	56.71	40	19	41.8	74, 79	10.95	87.1	11.06	38.2	5.33	36.3	1.5
309	18	10	47.69	23	22	15.7	75	10.95	87.1	11.06	38.2	5.33	36.3	1.5
310	18	14	1.05	27	34	16.9	74, 80	10.95	87.1	11.06	38.2	5.33	36.3	1.5
311	18	21	26.99	28	2	51.2	73	10.95	87.1	11.06	38.2	5.33	36.3	1.5

## LIST OF 487 SOUTHERN STARS FOR 1850—Continued.

NUMBER.	WASHINGTON TRANSIT-CIRCLE.				YARNALL.		STONE.		CORDOBA ZONES.		REMARKS.
	R. A. 1850.		S. Dec. 1850.		Years.		R. A.	Dec.	R. A.	Dec.	
	h. m. s.	° ' "	° ' "	° ' "			s	"	s	"	
312	18 23 48.30	36 29 6.6	74	74							
313	18 27 29.40	26 24 18.3	73, 74	73, 74							
314	18 28 31.20	32 48 10.4	75	75			31.17	10.4	31.10	11.2	31.31 11.3
315	18 31 9.68	27 40 19.0	76	76							
316	18 31 22.35	30 39 34.7	73, 75	73, 75					22.46	33.1	22.58 32.9
317	18 32 23.41	25 7 20.7	74, 75	74, 75			23.20	20.6			
318	18 34 56.05	31 32 41.9	73, 75, 76	73, 75, 76							
319	18 37 9.67	19 45 27.8	75	75			9.61	24.7			
320	18 37 17.86	22 32 37.9	75	75							
321	18 38 9.78	22 26 5.7	75	75			9.68	6.3	9.70	5.5	9.80 8.2
322	18 39 18.37	34 54 21.4	75	75			18.82	21.2	18.88	21.5	18.95 20.5
323	18 40 53.37	28 46 22.2	76	76							
324	18 45 [1]	21 32 17.7	74	74							
325	18 45 2.09	21 32 20.0	73, 75	73, 75			2.04	18.7			
326	18 46 36.77	29 39 47.3	73, 74	73, 74					36.67	45.0	
327	18 48 45.43	28 56 45.6	76	76			45.37	44.8			
328	18 51 32.12	34 42 27.7	73, 80	73, 80							
329	19 8 35.63	33 24 56.7	73, 74	73, 74			35.51	55.3	35.62	55.0	35.69 54.9
330	19 8 51.36	19 12 53.3	74	74			51.28	53.0	51.32	53.7	
331	19 9 59.90	29 17 19.5	74, 75	74, 75							
332	19 10 13.13	23 49 33.1	74, 80	74, 80			12.94	30.1			
333	19 11 46.07	25 48 20.0	73, 74	73, 74							
334	19 16 [8.60]	24 47 [42.8]	73	73			[8.58]	[41.2]	[8.61]	[42.9]	[8.70] [42.6]
335	19 22 41.74	28 31 25.2	73	73			41.58	23.7	41.61	22.7	41.71 20.4
336	19 23 25.18	23 3 14.5	73	73			25.12	11.0			
337	19 26 40.46	26 37 28.4	75, 76, 77	75, 76, 77							

[illegible]



Star has a proper motion of  
—0.2.

402	22	15	16.54	15	42	5.1	75.76, 77	44.63	20.7	44.65	20.0	44.69	20.2
403	22	17	44.66	28	46	21.1	78, 74	.....	.....	.....	.....	.....	.....
404	22	17	56.04	15	42	42.5	75, 76, 77	.....	.....	.....	.....	.....	.....
405	22	20	44.98	30	45	20.9	78	.....	.....	.....	.....	.....	.....
406	22	21	44.26	31	12	19.4	78, 74	44.22	17.2	.....	53.0	20.95	53.1
407	22	27	20.95	24	45	54.8	78, 74	20.87	54.0	20.92	.....	.....	.....
408	22	29	19.41	29	49	19.2	78, 74	.....	.....	.....	58.3	15.82	57.5
409	22	30	15.20	39	55	59.2	78, 74	15.16	59.0	15.21	36.6	22.17	35.0
410	22	30	22.17	33	51	37.6	78, 74	.....	.....	22.10	.....	.....	.....
411	22	34	27.96	38	27	14.5	78, 74	.....	.....	.....	26.8	18.33	26.0
412	22	37	18.33	26	1	28.5	78, 74, 80	18.17	25.6	18.25	6.0	53.42	7.2
413	22	38	53.31	34	57	10.1	78	.....	.....	53.19	.....	.....	.....
414	22	47	27.17	20	56	15.8	78, 74	27.03	14.3	.....	.....	33.89	[51.1]
415	22	47	33.99	[32	25	59.17]	78, 73	33.94	[51.8]	33.81	[53.8]	13.02	13.6
416	22	50	13.17	36	19	15.6	78, 74	13.02	14.4	12.98	14.9	13.57	58.7
417	23	0	13.45	29	37	61.9	78	13.55	59.9	13.41	59.7	.....	.....
418	[23	1	26.67]	[21	59	10.1]	78	[26.53]	[9.1]	[26.56]	[6.8]	.....	.....
419	23	2	1.94	36	12	41.2	78, 74	.....	.....	.....	.....	.....	.....
420	23	5	11.31	30	52	11.5	78, 80	11.20	11.4	.....	.....	.....	.....
421	23	11	0.76	29	12	30.4	78	0.85	25.6	0.70	28.1	0.78	27.7
422	23	11	12.45	39	58	40.3	78	12.05	37.2	12.18	36.8	12.07	33.9
423	23	18	13.07	28	14	60.0	78	13.00	58.1	13.05	57.9	13.16	57.9
424	23	29	9.14	32	42	6.0	78	9.04	3.0	9.00	3.3	9.18	2.3
425	23	32	27.96	27	43	13.5	78	.....	.....	.....	.....	.....	.....
426	23	33	57.54	20	35	23.0	78	.....	.....	.....	.....	.....	.....
427	23	35	21.90	24	30	26.5	78	.....	.....	.....	.....	.....	.....
428	23	36	40.07	27	4	44.3	78	.....	.....	.....	.....	.....	.....
429	23	40	44.95	19	43	4.7	78, 80	40.08	41.2	39.88	44.7	40.01	40.5
430	23	41	39.94	22	26	53.7	78	.....	.....	.....	.....	.....	.....
431	23	48	23.35	22	49	41.0	78	39.90	50.3	39.83	53.2	23.45	40.0
432	23	48	45.97	25	34	21.7	78, 74	23.24	38.7	23.26	38.5	45.93	19.6
433	23	49	43.37	37	32	26.0	78, 74	45.86	21.7	45.84	22.1	43.45	24.4
434	23	49	52.89	37	32	26.0	78, 74	43.32	24.0	43.30	24.0	43.45	29.9
435	23	49	52.89	34	1	30.6	78, 74	52.78	29.5	52.88	29.8	53.02	29.9
436	23	55	26.14	24	58	51.8	78	25.98	48.6	26.00	50.3	26.06	49.8
437	23	59	9.35	23	56	30.9	78	25.98	28.7	29.29	29.1	9.36	29.0
437	23	59	29.90	33	45	50.2	78, 74	29.83	52.3	29.84	49.6	29.77	49.7



# VII. COUNTS OF STARS IN THE BONNER DURCHMUSTERUNG BETWEEN $-2^{\circ}$ AND $+13^{\circ}$ ,

MADE AT THE COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN, WISCONSIN, AND REVISED AT THE WASHBURN OBSERVATORY.

The statistics of the distribution of stars in the D. M. have been treated by ARGELANDER in Vol. V. of the Bonn observations. In § 3 of that work he describes tables "in denen die Zahl der Sterne angegeben ist, die sich auf jeder Flaechе von  $1^{\circ}$  Ausdehnung in Declination, und in R. A. bis  $60^{\circ}$  vom Aequator von  $1^{\circ}$ , von da ab bis  $80^{\circ}$  von  $2^{\circ}$ , noerdlicher auf groesserer Ausdehnung befinden."

As these tables are not accessible, and as such data would be of great interest in connection with any system of star-gauges, my friend, Rev. Professor HAGEN, together with several of his pupils began the very laborious task. This was continued till January, 1885, when, by the courtesy of Professor H. SEELIGER, I received his paper "Ueber die Vertheilung der Sterne auf der noerdlichen Halbkugel nach der Bonner Durchmusterung" (*Sitzungsber. der math. phys. Classe der K. Bayer. Akad. d. Wiss.* 1884.), in which he announces the completion of such a count and its intended publication in the Annals of the Munich Observatory. As the very laborious work has already been twice independently done, not to mention the further counts of v. LITTRÖW, CELORIA and PEIRCE, I could not advise the continuance of our third attempt, and accordingly it has been stopped at the point reached in January, 1885. The results are given in the following pages. The only check which has been applied to the counting is a comparison between the total number of stars in each  $1^{\circ}$  Zone from  $0^h$  to  $24^h$  as counted, and as given in the D. M. The original counts have been corrected in quite a number of instances, until they fulfilled this condition. After this was done I inserted the various errata, etc., so that the numbers now given do not agree with the D. M. as printed.

Although small errors may very likely still remain, they are of no importance for the purpose for which these counts were made.

## SUMMARY OF THE COUNTS OF STARS, AS REVISED, WITH CORRECTIONS INSERTED.

Zone	- 1°	4530+1+1-1+1-1	=4531
	- 0	4620-1+1+1+2+2+1-1	=4625
	+ 0	5087-1	=5088
	+ 1	4833-1-1+1	=4832
	+ 2	4754+1+1+1+1	=4758
	+ 3	4935+0	=4935
	+ 4	5092+1+1	=5094
	+ 5	5263+0	=5262
	+ 6	5243+1+1	=5245
	+ 7	5129+0	=5129
	+ 8	5172+1+1-1+1-1?+3-1[-1]-1-1[-1]	=5174
	+ 9	5323+1	=5324
	+10	5026-1	=5025
	+11	5097+1	=5098
	+12	5070+1+1+1	=5073

COUNTS OF STARS IN ARGELANDER'S DURCHMUSTERUNG;  
COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN.

HOURS.	Incl. Excl.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min..	0-4	6	6	8	7	12	19	24	28	18	11	11	8	11	9	12	7	11	7	5	21	17	7	9	8
	4-8	11	9	8	15	8	14	28	30	18	12	4	7	5	9	11	12	17	4	4	12	21	18	15	9
	8-12	8	7	8	9	9	19	24	41	16	12	11	8	11	7	9	5	10	8	12	19	17	13	9	7
	12-16	15	10	11	7	15	21	32	33	15	11	8	9	11	12	9	6	7	8	7	20	16	13	5	10
	16-20	6	9	9	17	15	22	23	33	18	10	9	9	13	9	5	14	13	13	16	17	8	9	12	
	20-24	9	14	13	5	14	26	20	24	18	11	8	9	16	7	7	5	14	14	10	15	7	4	11	9
	24-28	11	5	12	10	13	31	24	25	22	9	10	6	10	9	5	7	11	16	16	14	6	14	11	
	28-32	11	18	12	4	16	36	27	19	12	6	10	9	10	8	4	7	11	7	12	25	17	10	14	9
-1°.	32-36	10	8	12	4	19	20	32	24	21	9	14	10	15	5	8	10	13	11	19	10	16	8	2	14
	36-40	12	7	7	12	13	15	30	23	14	7	10	9	6	6	8	10	6	11	13	16	16	7	8	7
	40-44	9	12	5	12	16	16	31	23	15	10	11	9	8	7	5	12	12	18	16	14	9	7	5	4
	44-48	8	7	16	13	18	20	46	29	14	6	7	10	6	11	6	9	11	7	20	17	15	8	6	9
	48-52	8	7	12	11	15	19	33	22	12	13	6	11	10	9	5	7	10	12	17	16	12	7	9	12
	52-56	11	15	11	5	18	13	30	22	20	8	8	13	12	12	6	6	7	6	13	11	10	14	15	8
	56-60	13	10	7	12	17	18	39	26	14	7	11	9	12	8	13	2	9	16	28	10	10	12	10	9
	0-4	11	9	8	5	9	26	25	31	16	14	8	10	3	7	8	12	15	10	17	18	23	14	10	12
	4-8	14	9	8	17	12	18	31	21	19	17	10	9	15	7	6	8	17	12	12	9	17	12	7	13
	8-12	17	10	11	9	17	27	22	23	13	16	9	4	5	6	12	4	10	14	13	23	14	10	13	14
	12-16	13	12	12	13	14	15	21	21	22	9	9	8	6	6	7	10	12	8	12	27	23	7	14	6
	16-20	8	19	5	11	7	20	23	28	12	13	12	6	12	6	10	9	8	15	15	16	14	7	8	
	20-24	13	12	15	11	8	26	22	18	16	10	9	4	7	8	7	8	13	18	15	20	23	12	15	6
	24-28	12	11	13	8	17	30	29	19	16	9	7	10	6	9	13	9	14	18	13	20	16	7	10	11
	28-32	7	3	14	12	15	29	27	15	13	13	2	13	6	13	4	6	15	11	13	22	18	6	12	10
-0°.	32-36	11	5	9	10	18	24	31	16	13	8	5	9	4	10	12	10	14	14	10	20	11	9	12	17
	36-40	8	10	17	8	10	20	23	29	14	9	8	15	8	6	20	6	11	13	15	14	16	11	9	6
	40-44	11	11	10	11	17	22	34	22	10	12	4	7	11	14	10	15	13	11	21	16	23	11	7	10
	44-48	13	11	11	10	15	13	29	12	15	9	11	11	8	13	10	9	6	12	19	20	10	7	9	10
	48-52	12	7	15	6	14	14	34	18	13	6	4	7	12	7	12	12	5	14	27	14	14	11	7	12
	52-56	10	6	19	8	15	18	41	16	16	11	5	9	13	7	7	7	11	7	14	11	11	6	12	14
	56-60	12	12	8	10	17	27	35	21	10	10	6	11	5	6	7	2	11	14	19	12	13	9	11	8
	0-4	9	8	8	15	10	24	22	36	25	16	11	8	12	9	14	11	8	14	20	17	17	16	12	7
	4-8	14	12	8	15	11	23	35	30	14	13	9	6	10	7	8	10	13	11	23	25	13	13	7	6
	8-12	10	10	13	14	14	15	31	28	36	7	5	6	8	7	7	15	18	10	19	22	24	13	9	8
	12-16	12	11	8	16	10	28	22	21	18	10	8	15	12	4	11	10	17	8	9	19	12	12	17	4
	16-20	13	9	11	10	17	36	27	28	15	13	9	10	9	10	11	7	9	14	12	17	17	12	7	7
	20-24	10	10	12	11	18	28	31	27	19	8	10	3	4	7	13	7	14	11	17	26	18	9	12	11
	24-28	13	10	17	10	12	25	33	27	17	4	9	12	6	11	8	12	16	19	17	17	20	12	9	7
	28-32	15	9	10	22	23	17	33	28	19	7	12	9	10	9	11	12	7	21	16	16	17	10	8	10
+0°.	32-36	18	10	8	12	19	19	34	26	13	8	9	11	12	5	11	5	11	16	14	21	15	13	9	12
	36-40	5	14	10	8	18	18	39	28	21	12	8	10	5	10	16	10	9	14	18	20	10	7	11	9
	40-44	11	8	15	13	25	13	50	24	15	11	2	12	8	6	15	12	9	18	16	22	9	7	7	13
	44-48	13	11	7	11	23	21	57	18	21	13	8	9	9	2	16	15	9	15	17	19	19	11	10	6
	48-52	16	15	10	8	14	25	37	21	12	15	9	14	7	7	14	11	10	19	21	24	16	5	9	8
	52-56	11	16	14	4	18	21	34	21	13	8	6	12	6	12	13	8	16	16	15	25	20	9	9	6
	56-60	17	14	15	8	20	30	30	24	9	8	18	10	10	4	4	9	13	12	21	24	12	11	9	6

COUNTS OF STARS IN ARGELANDER'S DURCHMUSTERUNG;  
COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN.

HOURS.	Incl.	Excl.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min. 0-4	16	11	11	13	13	22	23	29	23	14	9	7	11	6	6	10	8	14	16	23	17	14	3	9		
4-8	8	13	17	8	9	22	26	25	26	11	7	12	7	5	10	11	15	6	20	27	15	13	6	8		
8-12	16	12	11	8	9	21	33	23	19	14	3	9	11	4	7	13	17	13	17	21	22	8	5	8		
12-16	11	6	10	8	12	25	18	14	15	16	9	7	5	5	8	8	16	10	10	18	18	13	4	11		
16-20	14	10	6	12	8	24	32	26	15	13	13	9	10	7	14	9	18	8	17	16	15	9	10	6		
20-24	10	8	9	14	8	28	27	17	20	12	8	10	11	7	10	12	8	15	25	22	15	14	8	7		
24-28	16	17	8	11	13	17	30	26	20	11	7	9	10	7	5	8	16	12	19	19	15	9	8	9		
28-32	21	9	16	18	16	23	40	18	11	10	7	11	10	6	11	9	15	17	18	20	15	14	7	13		
+1°. 32-36	13	13	13	11	12	24	30	15	10	13	7	9	12	8	6	12	17	9	21	20	16	14	3	7		
36-40	13	9	12	10	16	20	34	18	11	7	8	6	12	5	15	10	10	17	23	18	9	10	9	10		
40-44	12	20	17	6	11	19	41	22	18	13	11	9	8	7	7	6	18	19	13	17	19	13	7	16		
44-48	14	7	8	11	23	9	34	20	17	11	9	10	7	6	13	7	22	14	24	23	14	8	7	15		
48-52	17	10	9	9	21	15	34	19	11	6	5	8	6	7	8	8	13	13	23	23	9	8	6	9		
52-56	17	9	11	6	17	29	34	14	14	6	6	5	12	13	8	7	11	18	21	28	12	8	5	11		
56-60	12	9	17	9	13	17	39	17	10	8	10	13	3	8	11	5	22	28	31	15	7	11	8	13		
0-4	11	11	12	13	8	16	14	34	16	10	11	10	5	14	10	7	12	11	29	22	12	13	4	13		
4-8	11	7	7	9	11	16	25	24	23	15	9	8	5	9	13	14	6	20	23	23	19	10	6	18		
8-12	14	14	8	18	17	19	12	25	18	8	4	7	6	11	5	8	12	14	17	14	6	12	11	8		
12-16	6	8	7	13	15	20	22	22	19	15	6	5	4	11	8	8	12	11	23	18	20	11	8	10		
16-20	12	13	12	13	18	28	28	15	25	10	2	14	8	8	13	11	17	15	12	23	21	10	6	6		
20-24	7	13	13	9	15	19	33	12	18	11	5	7	11	9	12	9	15	16	10	20	17	11	7	7		
24-28	12	11	9	10	5	26	29	19	20	8	9	11	2	8	3	7	13	24	13	22	13	14	12	11		
28-32	12	7	7	13	12	19	33	21	20	10	9	8	8	9	12	4	16	16	19	22	15	4	15	11		
+2°. 32-36	11	10	14	15	10	14	32	29	17	9	8	12	8	10	7	2	10	13	24	19	18	10	12	9		
36-40	8	17	9	12	17	19	31	23	12	8	5	12	8	8	8	10	15	13	21	17	16	16	9	6		
40-44	15	11	7	11	19	12	40	26	13	8	6	9	12	11	11	15	12	13	12	19	13	19	9	14		
44-48	12	16	13	7	23	10	28	16	20	10	6	4	9	11	12	11	13	14	26	25	12	9	11	6		
48-52	10	12	8	11	17	17	29	17	19	5	5	5	9	11	11	5	17	19	27	19	6	11	8	11		
52-56	9	18	10	6	17	15	36	17	16	10	5	9	7	12	10	7	16	27	15	28	13	12	11	7		
56-60	9	7	12	7	20	20	28	20	12	7	8	6	9	6	8	14	15	20	25	12	11	6	11	6		
0-4	15	6	12	2	5	29	23	35	20	15	11	8	13	4	7	11	15	15	32	32	19	12	11	6		
4-8	10	11	14	15	11	26	28	28	16	15	12	8	6	7	10	14	15	10	21	18	23	16	13	9		
8-12	6	7	13	8	9	23	16	20	19	13	7	8	12	11	4	5	7	10	24	22	15	12	7	8		
12-16	6	7	5	9	11	27	25	24	16	7	9	9	9	7	7	7	18	14	24	21	17	15	3	8		
16-20	9	9	9	9	7	30	32	21	14	12	13	10	8	11	8	16	17	15	22	31	11	8	10	5		
20-24	12	9	9	10	9	43	25	19	15	14	8	11	15	10	6	13	13	18	16	23	12	1	12	4		
24-28	11	8	13	11	8	24	32	22	18	11	14	8	10	8	10	8	16	25	20	28	20	14	13	10		
28-32	13	7	10	12	24	31	20	14	16	9	4	3	10	8	10	10	11	15	25	16	13	14	10			
+3°. 32-36	14	9	6	10	16	20	29	24	11	13	5	10	10	9	12	16	17	15	18	21	18	10	15	2		
36-40	9	10	7	6	23	19	33	22	13	6	7	10	15	4	9	6	14	11	16	23	17	9	11	6		
40-44	7	6	12	8	19	22	32	26	23	6	15	12	3	6	10	4	19	17	12	24	14	12	4			
44-48	13	14	10	6	19	17	28	19	18	16	8	7	13	8	8	8	15	22	22	25	17	8	10	4		
48-52	9	6	11	8	21	14	29	22	19	12	9	11	2	6	8	12	13	21	24	20	17	13	11	13		
52-56	15	8	7	6	21	25	33	18	18	9	6	7	9	8	8	10	16	22	24	17	16	7	10	9		
56-60	11	8	9	9	19	16	28	16	15	6	11	8	10	12	7	8	15	19	20	26	14	10	11	11		

COUNTS OF STARS IN ARGELANDER'S DURCHMUSTERUNG;  
COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN.

Hours.	Incl.	Excl.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min..	0-4		13	17	11	11	11	16	29	25	22	14	3	13	8	10	7	8	13	14	32	26	22	10	12	14
	4-8		10	11	10	10	15	26	22	23	12	16	9	8	8	5	6	11	15	18	28	32	22	8	11	12
	8-12		8	5	7	8	11	16	25	21	11	13	7	6	8	17	7	12	14	28	33	30	22	18	13	7
	12-16		12	16	8	6	10	16	32	22	11	16	11	6	13	11	10	12	12	16	26	18	21	9	7	9
	16-20		14	14	8	6	10	21	28	22	16	10	11	15	6	12	5	8	13	13	25	26	14	16	9	8
	20-24		8	15	14	7	12	23	34	24	15	11	12	15	7	6	11	6	16	15	29	23	22	20	9	9
	24-28		12	12	5	13	10	22	35	24	6	12	11	13	5	12	8	11	14	12	18	27	22	8	11	9
	28-32		10	11	7	10	13	22	40	21	8	11	9	9	7	6	9	9	16	20	28	16	17	13	9	4
+4°.	32-36		15	17	10	10	12	19	42	25	18	8	10	10	4	4	12	9	12	16	23	24	16	12	9	9
	36-40		17	6	12	12	12	18	30	23	16	14	5	10	11	7	11	8	16	21	33	29	20	13	10	8
	40-44		10	10	7	4	13	23	30	16	16	12	8	3	11	9	13	11	15	27	13	19	16	16	8	10
	44-48		9	8	12	13	14	13	34	17	17	5	8	16	6	10	7	9	12	16	14	28	14	7	6	9
	48-52		11	6	15	8	22	18	26	18	16	11	7	10	11	7	9	12	20	15	29	23	11	16	13	8
	52-56		15	9	10	13	22	17	27	14	16	8	9	9	8	11	8	13	14	15	21	25	13	11	19	6
	56-60		22	9	8	9	17	17	31	21	14	11	9	10	5	10	14	11	16	26	21	23	14	16	9	9
	0-4		9	6	11	6	13	20	26	28	21	16	9	11	10	4	8	5	19	14	22	23	22	21	12	9
	4-8		15	9	11	4	15	32	29	31	20	9	11	9	9	7	8	7	14	13	29	35	25	13	16	6
	8-12		9	6	9	17	12	22	37	19	14	12	9	10	7	5	5	8	8	14	30	19	17	12	15	7
	12-16		14	8	14	7	12	19	30	17	24	12	10	14	11	5	9	9	9	14	29	15	17	20	16	7
	16-20		7	11	11	10	18	21	22	28	16	9	8	4	7	7	5	6	17	13	26	22	18	7	14	7
	20-24		8	14	10	10	11	21	36	23	16	11	8	6	9	11	8	20	15	15	30	22	20	25	4	17
	24-28		15	14	13	9	13	19	33	23	15	14	12	7	7	14	6	12	7	15	26	31	25	17	9	7
	28-32		12	5	10	11	14	16	37	23	19	9	15	13	15	6	7	11	17	18	31	24	16	17	14	11
+5°.	32-36		6	12	11	11	18	20	31	23	17	14	15	12	11	14	12	13	15	17	50	37	17	21	12	7
	36-40		9	12	9	6	15	14	26	26	16	6	13	7	7	7	10	18	10	34	19	30	20	11	12	7
	40-44		10	9	10	12	21	17	40	23	13	12	12	11	7	7	11	12	14	27	16	16	23	16	19	6
	44-48		8	10	14	7	18	15	26	26	14	8	6	5	8	9	8	21	6	19	15	32	15	14	12	13
	48-52		8	11	13	12	14	12	29	14	6	14	8	10	6	11	12	3	9	20	21	25	17	18	10	5
	52-56		9	5	13	9	14	16	19	12	15	9	9	11	9	9	8	10	12	25	16	32	22	19	6	10
	56-60		7	6	8	7	16	24	26	15	15	14	14	8	9	11	11	11	17	22	16	16	17	16	13	10
	0-4		3	9	7	12	11	21	28	34	14	11	7	10	9	7	13	11	20	9	20	17	24	18	16	7
	4-8		9	16	7	8	7	16	19	28	18	18	9	12	11	13	10	4	12	16	20	24	21	14	10	7
	8-12		9	13	5	16	10	18	24	23	23	10	14	7	13	10	8	7	11	11	27	19	15	14	7	8
	12-16		11	14	10	5	13	20	27	33	14	18	10	11	20	9	6	9	15	17	30	29	13	18	17	8
	16-20		19	13	13	9	13	13	28	29	14	14	8	8	8	10	12	14	14	17	45	21	23	15	11	9
	20-24		10	9	9	10	13	18	24	31	20	5	7	7	11	7	15	14	10	19	52	37	17	16	9	10
	24-28		12	9	18	16	13	17	20	20	13	8	3	9	9	11	12	7	12	18	30	31	30	12	8	6
	28-32		12	12	10	5	18	22	36	20	15	6	11	12	4	10	11	15	15	29	26	35	20	17	4	7
+6°.	32-36		8	8	6	13	12	18	33	25	18	9	9	9	12	6	8	11	21	28	29	23	13	8	7	
	36-40		10	9	10	10	11	21	19	13	15	4	9	14	12	13	10	10	16	21	31	35	21	15	11	14
	40-44		12	16	15	7	17	21	26	16	9	9	16	13	5	9	9	11	10	25	20	32	21	10	8	9
	44-48		9	14	10	10	9	21	31	23	15	9	4	9	8	6	9	11	10	20	22	21	27	12	14	6
	48-52		13	11	13	10	19	13	30	21	17	10	11	10	9	9	9	15	13	14	14	29	18	13	8	11
	52-56		12	8	9	12	20	18	31	21	14	10	15	8	8	7	10	8	14	17	13	24	22	13	15	11
	56-60		10	7	13	8	23	27	24	12	13	13	9	10	6	13	20	15	11	21	22	29	17	13	11	5

COUNTS OF STARS IN ARGELANDER'S DURCHMUSTERUNG;  
COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN.

Hours.	Incl.	Excl.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min..	0-4		13	10	18	5	12	21	37	34	13	5	20	8	6	9	7	14	13	8	23	22	15	18	13	
	4-8		7	9	4	6	12	18	33	24	13	8	6	5	5	6	13	14	6	26	16	23	11	16	8	
	8-12		13	8	13	10	6	18	31	29	10	12	13	6	7	6	7	15	14	15	24	19	24	12	14	10
	2-16		10	6	10	6	8	14	23	26	14	13	14	9	6	5	6	11	21	16	34	27	14	11	17	13
	16-20		9	8	11	8	10	21	34	17	6	7	14	4	6	11	12	12	18	20	31	24	22	17	14	12
	20-24		10	17	10	4	13	17	33	26	10	13	12	7	8	8	11	10	15	16	32	33	11	17	8	
	24-28		12	7	5	7	10	23	36	22	8	15	12	5	3	11	11	9	16	15	30	35	13	10	9	17
	28-32		14	17	6	6	16	25	26	23	14	8	11	10	6	9	11	19	10	24	30	27	14	11	13	11
+7°.	32-36		12	15	11	11	15	24	32	25	12	6	7	3	8	8	11	14	8	19	29	31	22	11	10	9
	36-40		9	13	10	5	19	33	29	13	6	12	11	8	7	6	12	14	21	18	23	33	13	7	12	5
	40-44		11	11	9	11	22	16	35	10	13	11	17	7	5	16	9	16	11	18	26	35	16	8	8	9
	44-48		13	5	10	14	13	28	33	21	5	13	7	6	10	13	13	11	12	20	31	33	15	10	11	7
	48-52		8	11	10	11	14	26	26	25	11	7	9	5	8	5	8	12	12	16	23	30	22	10	6	11
	52-56		13	8	9	10	12	26	28	13	11	16	9	10	7	11	14	14	11	16	25	29	13	13	11	13
	56-60		16	15	10	9	28	30	32	17	11	7	14	5	6	13	10	17	16	20	23	19	12	9	13	6
	0-4		13	8	10	9	9	17	27	26	18	11	9	7	4	4	8	13	11	15	22	17	32	11	19	16
	4-8		8	13	13	12	12	23	28	29	27	14	6	10	6	7	8	9	9	16	18	19	20	10	17	16
	8-12		11	11	10	10	12	18	27	26	12	12	9	10	5	9	10	9	15	15	23	29	13	14	14	12
	12-16		8	14	6	14	11	20	33	15	17	12	11	8	7	7	13	11	11	13	23	26	20	11	14	11
	16-20		14	14	6	11	14	25	35	24	13	8	9	11	9	8	10	14	13	13	30	31	20	16	14	11
	20-24		10	6	16	7	10	17	31	17	13	12	11	7	7	11	4	6	16	20	28	22	14	13	10	9
	24-28		13	10	8	9	15	24	31	22	11	8	9	13	12	9	18	12	17	15	30	31	14	7	14	8
	28-32		13	6	12	11	14	22	24	24	17	6	7	7	3	10	12	8	17	11	28	26	24	16	14	14
+8°.	32-36		12	9	6	9	14	18	31	15	4	11	9	3	10	12	11	12	14	15	29	15	16	9	10	8
	36-40		6	11	9	13	17	22	37	20	16	6	14	5	5	8	10	12	14	13	31	22	23	16	12	13
	40-44		10	8	14	18	20	22	31	22	13	13	7	3	12	14	7	15	10	22	25	24	18	10	15	12
	44-48		10	15	10	11	16	21	33	19	7	8	12	5	7	10	13	9	16	21	28	28	17	15	16	16
	48-52		18	6	7	9	4	20	30	20	12	11	12	6	7	15	13	13	15	17	27	25	19	9	14	11
	52-56		20	12	5	20	18	29	34	19	4	14	7	8	8	7	12	11	22	17	32	16	14	10	8	11
	56-60		13	11	3	9	24	33	29	15	11	7	9	8	4	7	12	10	10	17	21	29	16	10	14	6
	0-4		12	8	7	14	5	18	28	34	20	12	13	15	12	6	7	8	10	9	30	20	32	10	12	12
	4-8		6	3	14	8	5	25	37	28	16	11	9	6	12	10	9	8	12	17	32	31	26	13	11	14
	8-12		9	9	10	5	12	23	28	32	18	15	12	4	5	7	11	7	12	13	28	21	22	25	13	11
	12-16		11	4	10	9	8	14	28	14	21	10	10	10	6	12	5	8	13	15	31	25	24	16	12	14
	16-20		7	6	12	8	13	22	29	27	24	17	11	12	6	3	11	13	14	16	30	21	29	24	11	6
	20-24		11	11	5	10	10	21	24	26	20	8	7	12	9	14	16	14	6	17	32	24	23	20	14	11
	24-28		10	7	10	7	14	27	24	27	14	13	10	6	9	12	9	15	14	14	28	27	27	13	9	19
	28-32		6	12	6	12	15	29	29	24	15	14	7	11	6	11	11	8	13	17	27	33	16	20	12	6
+9°.	32-36		7	10	10	7	15	25	45	19	14	9	15	12	12	6	5	11	12	11	38	38	21	18	15	14
	36-40		9	10	7	13	19	16	16	13	18	9	12	9	9	8	9	9	15	14	27	26	16	13	8	11
	40-44		9	9	5	17	13	28	31	25	14	12	12	4	11	8	7	6	16	22	27	34	12	13	15	8
	44-48		7	11	9	7	18	26	26	25	17	10	6	11	9	11	10	15	9	19	31	29	22	16	14	10
	48-52		7	10	8	12	13	26	29	15	12	15	9	7	10	5	19	4	6	19	26	35	13	20	12	13
	52-56		12	10	4	6	18	37	25	25	13	8	8	8	8	10	14	16	15	20	26	21	22	10	5	
	56-60		7	11	8	10	19	22	25	19	9	18	7	8	9	7	6	9	8	32	16	25	22	16	7	9

COUNTS OF STARS IN ARGELANDER'S DURCHMUSTERUNG;  
COLLEGE OF THE SACRED HEART, PRAIRIE DU CHIEN.

Hours.	Incl.	Excl.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min..	0-4		19	8	4	5	8	10	23	26	15	10	8	6	6	8	9	13	14	17	28	28	31	16	8	11
	4-8		9	16	8	8	6	17	32	20	14	13	9	9	7	10	15	14	8	10	23	25	29	14	12	10
	8-12		8	8	11	2	6	11	20	29	10	9	12	8	11	7	11	8	10	14	30	19	20	23	13	9
	12-16		13	12	5	6	6	14	26	26	13	15	5	6	12	6	11	15	5	17	19	21	16	18	12	12
	16-20		10	13	6	5	11	24	26	15	17	13	7	7	7	4	8	15	11	8	25	20	25	14	14	11
	20-24		5	11	7	11	8	20	20	19	13	12	12	11	11	9	11	13	14	14	23	31	19	14	12	7
	24-28		7	11	15	8	14	17	26	18	15	12	8	11	8	10	12	12	10	23	36	39	21	18	11	14
	28-32		7	11	7	4	6	19	22	14	15	14	7	8	12	10	9	8	13	15	31	36	17	14	12	14
+10°	32-36		12	10	8	7	8	22	34	22	15	8	12	11	6	8	11	10	13	10	21	21	16	11	15	9
	36-40		8	14	10	12	15	26	20	16	12	6	13	7	11	9	11	8	14	25	25	23	18	20	18	8
	40-44		11	11	6	14	13	23	35	21	17	8	8	7	7	8	12	9	16	12	36	34	13	16	13	13
	44-48		6	7	13	6	28	23	29	15	16	12	10	12	6	6	9	8	12	15	37	18	15	15	10	4
	48-52		6	8	7	12	11	30	34	21	13	13	8	11	9	7	10	13	14	20	34	31	11	11	13	9
	52-56		5	10	11	16	19	26	30	29	16	14	8	6	10	5	11	12	19	26	20	32	13	13	11	8
	56-60		11	13	7	10	16	27	28	20	7	11	13	9	6	14	7	9	16	22	18	22	15	15	14	3
	0-4		13	13	13	9	9	21	24	38	22	11	11	13	3	3	11	4	15	10	23	22	32	17	16	12
	4-8		9	5	15	8	5	15	30	22	18	9	14	14	8	5	8	9	17	21	22	20	22	20	15	19
	8-12		14	4	11	5	5	16	31	26	20	9	8	5	7	7	8	3	13	15	34	17	25	18	12	14
	12-16		15	8	10	6	10	17	30	27	13	15	10	3	4	3	7	7	14	13	24	21	33	15	15	15
	16-20		6	9	11	10	13	26	34	15	13	12	15	7	11	11	11	12	14	7	19	25	16	14	10	9
	20-24		8	10	12	10	5	24	25	12	17	12	9	10	6	10	4	7	13	14	25	26	28	17	21	14
	24-28		7	8	5	9	10	35	28	27	15	10	10	11	6	4	7	7	11	11	23	27	24	21	12	9
	28-32		3	9	10	6	8	27	23	12	14	16	10	8	3	5	9	14	6	17	29	30	25	18	15	12
+11°	32-36		12	11	8	11	5	21	27	16	11	9	11	9	8	6	9	12	9	19	31	31	22	19	18	7
	36-40		10	12	15	11	8	22	17	21	15	17	9	8	11	7	11	16	14	17	29	23	15	18	11	11
	40-44		8	8	11	7	12	12	25	20	15	9	11	4	5	6	12	8	13	14	32	32	24	15	13	9
	44-48		9	11	8	8	16	16	31	19	14	12	6	6	10	4	9	12	18	18	29	32	22	17	10	12
	48-52		12	9	10	16	17	20	37	15	11	14	5	7	7	6	7	9	10	18	21	28	21	15	14	6
	52-56		13	10	7	11	13	20	30	11	18	15	5	4	11	7	11	9	13	15	26	34	15	13	12	6
	56-60		5	9	12	8	10	24	31	15	11	18	6	9	9	13	12	16	23	28	29	24	12	11	8	
	0-4		11	5	10	12	7	13	29	29	11	14	18	5	9	7	9	12	13	11	25	28	21	17	16	9
	4-8		2	9	15	6	6	10	33	16	13	17	16	3	5	12	7	13	15	17	19	22	16	18	15	11
	8-12		5	10	7	9	10	19	33	24	15	16	12	12	9	10	9	9	16	14	32	15	23	9	18	14
	12-16		7	9	7	4	6	14	18	26	14	10	14	11	14	9	8	9	14	13	31	22	21	23	13	7
	16-20		10	9	12	6	13	10	32	30	12	11	8	3	7	2	8	6	10	15	31	16	24	16	6	8
	20-24		11	4	8	12	8	15	18	26	18	11	9	4	15	5	8	11	12	15	32	33	28	9	9	11
	24-28		11	8	11	3	8	15	29	28	10	13	8	6	7	5	9	11	11	17	23	30	24	8	13	8
	28-32		13	13	12	7	11	25	26	19	19	12	10	13	11	7	9	13	17	16	29	32	28	8	19	4
+12°	32-36		11	15	15	6	16	27	21	28	10	8	9	10	6	3	10	12	11	10	14	41	30	14	11	7
	36-40		7	12	5	3	13	22	36	19	8	13	8	7	7	11	9	13	19	12	25	30	19	18	10	7
	40-44		12	12	11	10	13	22	31	20	20	10	10	11	6	7	12	11	9	16	30	31	18	13	10	9
	44-48		9	7	12	9	15	29	27	20	13	9	8	8	9	8	8	4	11	17	34	27	19	12	13	12
	48-52		12	12	10	11	15	24	22	21	12	12	9	9	9	6	7	12	10	20	30	33	17	17	14	9
	52-56		5	10	12	8	22	27	33	21	6	8	9	11	5	2	6	14	18	23	32	30	17	16	8	4
	56-60		12	12	8	8	15	25	24	20	13	8	11	7	12	6	13	11	16	23	32	30	16	11	7	13

# VIII. CONSTANTS OF THE FAUTH TRANSIT INSTRUMENT AND ZENITH TELESCOPE.

For convenience, I give below a table of the constants of the FAUTH Transit Instrument and Zenith Telescope.

*Striding-Level*:—41 determinations made in June, July and August, 1881, gave 1 div. =  $1''.61 \pm 0''.008$ .

The level has been dismounted since that date and has undergone some material change, for later determinations give :—

$$\begin{aligned} 1 \text{ div.} &= 1''.47 \pm 0''.022, (41) \text{ September, 1884,} \\ .1 \text{ div.} &= 1.43 \pm 0.017, (10) \text{ April, 1885.} \\ 1 \text{ div.} &= 1''.450 \pm 0''.014 \} \\ &= 0''.097 \pm 0''.001 \} \text{ Adopted.} \end{aligned}$$

Radius of curvature = 920 feet.

*Latitude-Level*:—A new and more sensitive level was inserted in October, 1884. 1 div. =  $1''.42 \pm 0''.019$  (20) March, 1885. Radius of curvature = 850 feet.

*Micrometer*:—1 revolution =  $55''.19$ .

*Eye-pieces*:—Diagonal eye-piece magnifies 123 diameters.

Inverting eye-piece magnifies 62 diameters.

*Reticle*:—Wire A is the one nearest the clamp. A south star, clamp W., crosses the wires in the order A, B, C, D, E. The wires always retain the same name. They are engraved on glass. Their reductions to C<sup>s</sup> are :—

A. 14 <sup>s</sup> .761	B <sup>s</sup> . 8 <sup>s</sup> .832	C <sup>s</sup> .2 <sup>s</sup> .954	D <sup>s</sup> .5 <sup>s</sup> .819	E. 14 <sup>s</sup> .659
	B <sup>s</sup> . 7.417	C <sup>s</sup> .1.511	D <sup>s</sup> .7.315	
	B <sup>s</sup> . 5.921	C <sup>s</sup> .1.454	D <sup>s</sup> .8.844	
		C <sup>s</sup> .2.935		

*Pivots*:—Spherometer measures show the pivots to be circular in section. The diameter of each pivot is about 1.025 inches.

Observations with the striding level in October and November, 1882, made the clamp pivot the larger by 0.000053 inches =  $0^s.029 \pm 0^s.001$ .

Observations with the spherometer in June, 1885, gave,

$$0.000035 \text{ inches} = 0.019 \pm 0.004$$

Adopted,

$$p = -0^s.024 \pm 0^s.002.$$



## IX. METEOROLOGICAL OBSERVATIONS FOR THE YEAR, 1884.

## METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JANUARY, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted Snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per ct.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	29.025	-16.4	94	0.60*	20	15	29	416
2	28.721	7.4	91	0.20*	16	0	36	590
3	28.999	-11.3	78	.....	2	-15	24	436
4	29.312	-22.9	.....	.....	-15	-26	20	316
5	29.408	-17.0	84	.....	-13	-27	16	258
6	29.391	-9.5	72	.....	-4	-20	12	173
7	29.415	-6.2	78	.....	0	-14	8	75
8	29.074	+1.4	73	.....	10	-10	4	55
9	28.728	+4.4	86	.....	12	-8	10	80
10	28.795	14.8	74	0.01*	19	5	18	157
11	29.021	4.1	85	0.05*	14	-3	17	259
12	28.858	15.8	80	.....	17	5	25	316
13	28.556	33.9	81	.....	41	16	30	342
14	29.130	16.6	94	..**	30	6	20	330
15	29.344	3.1	74	.....	9	0	9	119
16	29.249	13.6	77	..**	16	-2	25	210
17	28.974	25.6	79	.....	33	13	29	517
18	28.868	19.7	91	0.07*	33	13	34	396
19	29.232	1.2	74	.....	14	-2	33	605
20	29.341	-1.1	67	.....	4	-9	12	180
21	29.049	14.4	71	.....	20	-4	31	224
22	28.822	20.9	85	.....	25	14	34	345
23	29.198	1.9	89	0.50*	21	-4	36	379
24	29.221	-9.5	75	.....	-1	-16	28	276
25	29.268	8.7	67	0.02*	14	-11	25	336
26	29.512	17.9	87	.....	24	7	18	159
27	29.220	25.1	81	0.20*	27	17	20	283
28	29.139	31.7	90	.....	35	25	21	263
29	29.009	33.2	95	.....	35	29	20	255
30	28.613	21.2	82	0.03*	37	11	24	327
31	28.808	9.6	78	.....	16	5	24	309
Sums ..	.....	.....	.....	1.65	.....	.....	.....	8,986
Means ..	29.074	9.2	81.4	.....	.....	.....	.....	.....

Highest barometer, 29.523 inches; lowest, 28.430 inches; highest temperature, 41.5°; lowest, -27.2°; range of barometer, 1.093 inches; range of thermometer, 68.7°; maximum velocity of wind, 36 mil-s, from north; prevailing winds, N. W., W. and S.; No. of clear days, 12; fair days, 12; cloudy days, 7.

No. of times the wind blew from the N., 11; N. E., 3; E., 0; S. E., 4; S. 19; S. W., 10; W., 18; N. W., 25. (Three observations daily.)

\* Melted snow. \*\* Precipitation too small to be measured.

## METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF FEBRUARY, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M. 9 P. M. MEANS REFER TO DAY ENDING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.773	20.6	79	0.05**	31	-3	26	233
2	29.063	25.5	82	.....	34	20	22	238
3	29.202	16.4	92	0.02*	25	12	20	234
4	28.898	20.5	95	0.06*	26	11	20	409
5	28.729	23.3	90	—***	27	20	18	241
6	28.971	20.0	86	0.11*	22	18	17	178
7	29.237	15.4	90	0.14*	18	8	17	275
8	29.107	20.1	90	0.01	28	16	16	137
9	29.308	13.3	75	0.01**	18	11	15	218
10	29.384	15.3	77	—***	22	0	7	85
11	29.269	14.6	93	0.60*	20	12	25	308
12	28.885	14.2	94	.....	16	10	25	487
13	28.796	8.0	88	0.20*	14	2	28	282
14	29.097	6.1	74	.....	16	-10	20	260
15	29.207	14.0	81	.....	20	-4	24	215
16	29.007	28.3	84	0.01*	33	19	36	504
17	28.762	32.3	92	0.28**	34	28	23	180
18	28.660	33.3	96	0.01*	34	30	20	177
19	28.626	18.6	84	0.42**	37	6	30	439
20	28.632	13.2	74	.....	23	-6	26	375
21	29.109	8.3	73	.....	29	-5	31	167
22	28.852	16.5	67	0.01*	28	9	40	411
23	29.063	7.5	76	0.19**	12	-1	80	283
24	28.981	16.4	82	.....	21	9	18	233
25	28.681	28.2	78	0.04**	36	11	26	340
26	28.897	27.3	83	—***	31	22	22	278
27	28.878	15.8	86	0.64*	27	8	24	227
28	29.046	-5.6	77	.....	8	-9	24	372
29	28.734	7.0	82	0.02*	11	-13	18	261
Sums...	.....	.....	.....	2.12	.....	.....	.....	8,247
Means..	28.962	16.9	84.0	.....	.....	.....	.....	.....

Highest barometer, 29.433 inches; lowest, 28.443 inches. Highest temperature, 37°; lowest, -13°. Range of barometer, 0.995 inches. Range of thermometer, 50°. Maximum velocity of wind 40 miles from S. W. Prevailing winds, N. and N. W.

No. of clear days, 5; fair days, 9; cloudy days, 16. No. of times the wind blew from the N., 21; N. E., 11; E., 3; S. E., 2; S., 16; S. W., 7; W., 4; N. W. 19. (Three observations daily.)

\*Estimated. \*\*Melted snow. \*\*\*Precipitation too small to be measured.

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF MARCH,  
1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 1½ P. M.			FOR 24 HOURS END- ING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	Inches.	°	Per cent.	Inches.	°	°	Miles..	Miles.
1	28.728	7.2	84	.....	12	4	30	374
2	28.583	8.1	83	0.35**	18	—4	23	213
3	29.079	0.8	71	.....	10	—8	22	333
4	29.173	4.8	70	.....	12	—9	18	197
5	28.998	10.5	75	0.07**	15	5	12	123
6	29.200	9.5	74	0.12**	15	5	14	136
7	29.204	6.9	80	0.14**	12	—3	15	162
8	29.035	11.7	86	0.21**	13	7	22	401
9	29.198	13.2	79	.....	23	6	16	110
10	28.810	25.1	76	0.20	30	4	30	310
11	28.333	31.5	83	.....	43	23	45	643
12	28.935	21.0	77	.....	28	9	42	669
13	28.236	26.3	83	.....	33	23	25	268
14	29.254	24.2	72	.....	31	14	17	156
15	29.140	26.7	65	.....	32	22	11	141
16	28.984	38.5	72	.....	42	23	28	272
17	29.167	32.3	78	0.06	42	30	22	181
18	29.092	32.5	88	*	36	27	12	180
19	28.924	32.9	98	0.05	34	31	12	234
20	29.123	38.0	59	.....	45	31	14	176
21	29.177	38.0	85	.....	42	29	12	127
22	28.858	44.0	92	0.43	50	35	12	150
23	28.771	37.6	80	.....	46	36	20	310
24	28.835	42.2	80	.....	52	32	18	200
25	28.583	39.2	85	0.40	46	36	36	196
26	28.771	47.8	60	0.05	57	36	36	429
27	28.770	49.2	68	.....	62	35	22	187
28	28.588	41.2	89	0.15	51	39	25	374
29	29.266	34.0	60	.....	40	31	24	370
30	29.313	33.3	73	*	41	25	18	173
31	28.915	42.8	84	0.08	49	31	20	285
Sums ..	.....	.....	.....	2.31	.....	.....	.....	8,083
Means.	28.968	27.4	77.7	.....	.....	.....	.....	.....

Highest barometer, 29.392 inches; lowest, 28.244 inches. Highest temperature, 62°; lowest, —0°. Range of barometer, 1.148 inches. Range of thermometer, 71°. Maximum velocity of wind, 43 mile; from South. Pre-vailing winds, N., S., N. W. Number of clear days, 8; fair days, 12; cloudy days, 11.

Number of times the wind blew from the N., 19; N. E., 10; E., 3; S. E., 11; S., 19; S. W., 12; W., 1; N. W., 16. (Three observations daily.)

\* Precipitation too small to be measured. \*\* Melted snow.

## METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF APRIL, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY ENDING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.607	33.3	95	0.98	34	30	25	226
2	28.873	34.9	70	.....	42	28	38	689
3	28.972	45.6	56	.....	55	32	24	279
4	28.945	43.6	65	.....	50	39	18	238
5	28.945	39.9	57	.....	49	31	12	110
6	28.934	38.5	67	.....	49	29	12	176
7	28.779	32.0	81	0.21	39	23	18	181
8	28.825	31.8	85	0.05	35	25	16	193
9	29.041	34.2	73	.....	39	31	12	145
10	29.052	37.8	63	.....	42	30	12	139
11	29.068	43.2	65	.....	49	35	14	108
12	28.993	43.3	66	.....	51	37	12	129
13	28.907	44.1	79	.....	48	36	14	186
14	28.492	55.7	89	0.95	69	43	24	295
15	28.368	40.0	97	1.35	58	34	30	277
16	28.827	38.7	75	.....	45	31	22	422
17	29.074	43.4	76	.....	55	31	16	177
18	29.001	48.5	79	0.08	58	38	17	265
19	29.045	42.4	86	0.12	50	40	20	180
20	29.301	34.7	72	0.11	40	32	40	687
21	29.387	37.7	56	.....	46	28	40	643
22	29.207	41.5	56	.....	49	28	36	491
23	29.107	46.8	45	.....	56	35	30	317
24	29.021	50.6	47	.....	62	37	20	193
25	28.914	53.2	50	.....	66	40	10	70
26	28.704	58.6	51	.....	70	41	36	361
27	28.618	49.4	69	*	59	46	45	756
28	29.112	48.0	64	.....	63	37	40	325
29	29.021	47.4	66	0.64	56	39	24	297
30	28.788	62.0	70	0.07	76	47	32	369
Sums...	.....	.....	.....	4.51	.....	.....	.....	8,874
Means..	28.930	43.4	69.1	.....	.....	.....	.....	.....

Highest barometer, 29.445 inches; lowest, 28.297 inches. Highest temperature, 76°; lowest, 25°. Range of barometer, 1.148 inches. Range of thermometer, 51°. Maximum velocity of wind, 45 miles from S. W. Prevailing winds, N. W. Number of clear days, 9; fair days, 13; cloudy days, 8. Number of times the wind blew from the N., 12; N. E., 11; E., 10; S. E., 12; S., 12; S. W., 2; W., 9; N. W., 21. (Three observations daily.)

\* Precipitation too small to be measured.

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF MAY,  
1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	Inches.	°	Per ct.	Inches.	°	°	Miles.	Miles.
1	28.650	47.8	88	0.85	62	46	25	255
2	29.100	47.1	58	0.45	58	40	28	299
3	29.069	54.8	69	.....	65	41	20	284
4	28.790	52.3	97	0.05	56	49	15	220
5	28.758	57.8	89	0.80	69	50	13	147
6	28.697	53.5	97	0.76	67	47	20	193
7	28.937	57.7	84	0.20	64	48	18	276
8	28.964	61.6	60	.....	73	50	16	157
9	28.942	58.9	86	.....	65	52	20	327
10	28.794	59.5	66	.....	71	52	24	239
11	28.938	54.6	59	.....	62	44	25	189
12	28.873	56.9	64	0.10	69	49	18	185
13	28.855	50.5	58	0.05	56	48	25	286
14	28.927	57.0	53	.....	67	45	28	339
15	28.888	51.3	47	.....	65	43	22	325
16	28.974	53.9	52	.....	65	36	20	249
17	28.888	64.3	48	.....	76	54	27	399
18	28.641	61.5	79	0.08	67	54	20	238
19	28.686	56.5	68	0.02	66	50	24	271
20	28.894	65.9	60	.....	76	52	24	244
21	28.927	68.6	63	.....	78	59	30	298
22	28.764	67.4	84	0.72	78	58	28	349
23	28.880	60.8	84	.....	67	58	32	433
24	28.998	56.9	89	0.05	63	53	25	288
25	29.018	55.4	89	0.08	59	52	15	139
26	28.923	59.6	77	.....	68	54	22	165
27	29.016	53.7	63	.....	63	51	22	272
28	29.284	47.6	56	.....	59	39	24	338
29	29.317	51.4	54	.....	65	42	12	129
30	29.138	61.8	41	.....	74	48	18	215
31	29.015	63.8	58	.....*	71	51	30	287
Sums ..	.....	.....	.....	4.21	.....	.....	.....	7,890
Means ..	28.919	57.1	67.3	.....	.....	.....	.....	.....

Highest barometer, 29.384 inches; lowest, 28.557 inches. High-st temperature, 78°; lowest, 36°. Range of barometer, 0.827 inches; range of thermometer, 42°. Maximum velocity of wind, 32 miles from South. Prevailing winds, S. W., S., N. W. Number of clear days, 11; fair days, 12; cloudy days, 8.

No. of times the wind blew from the N., 14; N. E., 9; E., 4; S. E., 8; S., 15; S. W., 18; W., 10; N. W., 15. (Three observations daily.)

\* Precipitation too small to be measured.

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JUNE,  
1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	29.020	61.6	89	0.23	71	60	22	297
2	29.016	59.7	94	1.15	67	56	18	174
3	29.041	64.7	77	.....	75	55	22	176
4	29.035	64.8	76	.....	75	55	20	156
5	28.964	65.1	85	.....	74	59	25	224
6	28.966	66.4	85	.....	76	59	15	192
7	28.885	69.5	81	.....	80	60	15	145
8	28.764	71.9	80	.....	79	63	22	225
9	28.887	54.7	82	1.04	70	52	35	446
10	29.008	60.3	66	.....	71	47	36	447
11	28.922	65.6	71	.....	77	51	12	100
12	29.010	66.7	75	.....	81	56	14	112
13	29.182	59.8	81	.....	70	54	20	185
14	29.276	62.9	66	.....	73	51	20	221
15	29.216	64.0	78	.....	73	66	13	183
16	29.141	69.6	84	.....	82	59	20	203
17	29.101	70.7	84	0.85	82	64	20	259
18	29.003	69.5	92	0.36	77	69	24	200
19	28.996	71.3	92	.....	82	66	8	64
20	28.998	71.4	86	0.31	82	66	12	160
21	29.014	70.3	90	1.29	80	66	30	134
22	29.006	73.0	88	.....	82	66	20	174
23	28.916	72.3	85	0.03	79	70	22	200
24	28.792	72.3	85	0.10	82	68	15	214
25	29.022	57.4	85	0.11	70	55	30	352
26	29.226	61.6	66	.....	71	50	20	251
27	29.242	66.0	74	.....	79	55	15	144
28	29.231	68.8	67	.....	82	58	14	127
29	29.103	73.3	76	.....	85	60	10	127
30	28.949	73.0	76	.....	85	67	13	139
Sums...	.....	.....	.....	5.47	.....	.....	.....	6,131
Means...	29.031	66.6	80.3	.....	.....	.....	.....	.....

Highest barometer, 29.301 inches; lowest, 28.728 inches. Highest temperature, 85°; lowest, 47°. Range of barometer, 0.573 inches. Range of thermometer 38°. Maximum velocity of wind, 36 miles from N. E. Prevailing winds, S. and E. Number of clear days, 10; fair days, 14; cloudy days, 6. Number of times the wind blew from the N., 5; N. E., 11; E., 16; S. E., 12; S., 32; S. W., 9; W., 2; N. W., 3. (Three observations daily.)

## METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JULY, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.904	71.9	59	.....	80	65	25	197
2	28.918	69.1	82	0.04	82	67	20	130
3	28.848	66.8	89	2.10	78	62	12	142
4	28.762	65.6	88	0.35	75	61	40	258
5	28.802	63.3	69	.....	70	60	30	303
6	29.027	61.5	72	.....	67	52	30	334
7	29.082	63.7	77	0.21	72	52	20	335
8	28.920	63.4	91	0.32	69	57	25	268
9	28.833	68.7	83	.....	77	62	25	309
10	28.910	68.8	73	.....	79	60	16	149
11	28.881	68.8	80	0.11	77	62	16	196
12	28.873	68.1	65	.....	76	65	40	193
13	28.949	61.8	67	.....	70	55	24	280
14	28.993	64.2	70	.....	69	57	20	179
15	28.976	63.5	77	0.10	71	61	12	91
16	29.027	64.4	72	.....	75	57	14	160
17	28.973	64.5	73	.....	75	58	12	158
18	28.945	66.8	70	.....	77	59	16	238
19	29.034	66.6	69	.....	76	62	22	195
20	29.157	65.8	66	.....	78	55	12	135
21	29.022	70.1	74	.....	80	58	16	203
22	28.833	77.5	75	.....	85	66	20	245
23	28.826	71.6	91	2.05	80	62	78	535
24	28.878	69.9	90	1.67	80	61	25	144
25	28.905	71.8	86	.....	81	66	30	208
26	28.820	70.6	86	0.08	82	64	20	163
27	28.852	72.3	73	.....	83	64	11	125
28	28.875	71.6	79	.....	80	65	6	80
29	28.814	71.8	77	1.35	80	64	20	78
30	28.705	67.3	89	0.06	77	63	24	144
31	28.850	67.6	72	.....	77	61	30	199
Sum	.....	.....	.....	8.44	.....	.....	.....	6,344
Means	28.907	67.7	73.5	.....	.....	.....	.....	.....

Highest barometer, 29.186 inches; lowest, 28.642 inches; highest temperature, 85°; lowest, 52°; range of barometer, 0.544 inches; range of thermometer, 33°; maximum velocity of wind, 78 miles, from N. W.; prevailing winds, N. W. and S.; number of clear days, 9; fair days, 16; cloudy days 6. Number of times the wind blew from the N., 7; N. E., 5; E., 2; S. E., 5; S., 19; S. W., 12; W., 10; N. W., 33. (Three observations daily.)

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF AUGUST,  
1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M. AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS END- ING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature	Mean relative humidity.	Rain or melted snow.	Maximum temperature	Minimum temperature	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per Cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.949	68.6	79	.....	80	63	15	121
2	28.866	71.9	82	0.63	82	63	30	255
3	28.844	64.1	81	0.12	71	62	30	313
4	29.013	56.5	79	0.03	65	52	30	455
5	28.926	66.9	74	.....	74	54	22	205
6	28.902	63.8	82	0.63	71	61	25	302
7	29.143	57.3	77	0.05	67	55	14	194
8	29.327	64.2	56	.....	67	49	10	124
9	29.307	61.1	63	.....	70	54	12	99
10	29.094	65.2	71	.....	72	53	20	190
11	29.972	68.8	69	0.02	77	60	21	334
12	29.053	69.5	78	.....	78	60	15	203
13	29.164	72.0	82	.....	81	61	12	103
14	29.203	78.8	66	.....	83	64	9	76
15	29.133	72.4	74	.....	84	64	12	114
16	29.032	73.8	72	.....	84	63	20	190
17	28.926	71.9	85	0.70	77	68	20	270
18	28.900	74.4	87	.....	81	69	26	362
19	28.929	76.9	86	0.88	85	68	30	333
20	28.859	73.5	80	0.33	84	68	30	400
21	29.084	63.7	70	.....	70	57	60	276
22	29.033	66.5	74	.....	73	56	12	170
23	29.108	61.9	69	.....	70	55	69	300
24	29.114	60.9	81	0.25	68	57	12	138
25	28.844	65.5	82	0.33	74	56	24	405
26	29.160	63.1	75	.....	73	56	18	207
27	29.104	65.9	84	.....	75	55	16	191
28	28.818	64.5	90	0.12	73	61	15	197
29	28.695	64.9	80	0.24	77	58	20	195
30	28.882	60.7	79	0.06	69	59	36	298
31	28.991	61.5	74	.....	71	54	22	139
Sums ..	.....	.....	.....	4.39	.....	.....	.....	7,157
Means ..	29.009	66.6	76.7	.....	.....	.....	.....	.....

Highest barometer, 29.346 inches; lowest, 28.836 inches. Highest temperature, 85°; lowest, 49°. Range of barometer, 0.710 inches. Range of thermometer, 36°. Maximum velocity of wind, 60 miles, from South. Prevailing winds, South. Number of clear days, 14; fair days, 15; cloudy days, 2. Number of times the wind blew from the N., 5; N. E., 2; E., 2; S. E., 9; S., 39; S. W., 12; W., 8; N. W., 16. (Three observations daily.)



METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF  
SEPTEMBER, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M. AND 9 P. M. MEANS REFER to DAY ENDING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature	Mean relative Humidity.	Rain or me'ted snow.	Maximum temperature	Minimum temperature	Maximum ve- locity of the wind.	Total mo ve- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.837	68.6	71	0.01	77	54	22	286
2	28.777	71.6	80	.....	79	63	26	439
3	28.839	72.6	74	.....	81	65	30	459
4	29.092	70.9	69	0.28	79	68	30	247
5	29.043	74.5	82	.....	83	66	25	242
6	28.926	74.9	83	.....	84	66	22	326
7	28.946	71.9	86	1.73	77	65	26	204
8	28.854	75.9	88	.....	86	65	25	189
9	28.922	76.6	80	0.01	85	71	22	294
10	28.917	71.5	81	0.63	84	65	26	333
11	29.245	59.2	72	.....	68	51	54	355
12	29.335	61.6	76	.....	71	52	10	107
13	29.344	61.1	77	.....	71	54	15	185
14	29.217	62.4	74	0.03	71	54	18	316
15	28.849	70.2	86	0.70	81	60	30	366
16	28.896	58.6	69	.....	71	54	48	426
17	28.903	57.9	62	.....	65	49	28	318
18	29.157	55.7	78	.....	66	48	24	171
19	29.082	63.3	70	.....	71	55	17	240
20	29.271	54.4	69	.....	63	47	28	207
21	28.990	63.2	78	.....	72	47	22	261
22	28.939	59.4	83	0.12	66	56	25	249
23	28.653	63.4	96	0.39	67	52	25	209
24	28.776	59.9	75	.....	68	58	32	404
25	29.157	57.0	81	.....	68	49	17	150
26	28.991	63.3	83	.....	70	50	24	265
27	28.770	64.2	87	.....	71	58	27	348
28	28.670	64.2	89	0.17	70	62	26	269
29	28.880	60.2	85	.....	72	53	15	197
30	28.966	64.1	89	0.18	74	61	35	350
Sums...	.....	.....	.....	4.25	.....	.....	.....	8,412
Means..	28.975	65.1	79.0	.....	.....	.....	.....	.....

Highest barometer, 29.378 in.; lowest, 28.517 in. Highest temperature, 86°; lowest, 47°. Range of barometer, 0.831 in. Range of thermometer, 39°. Maximum velocity of wind, 54 miles from southwest. Prevailing winds, south.

No. of clear days, 15; fair days, 13; cloudy days, 2. No. of times the wind blew from the N., 8; N E., 3; E., 1; S. E., 9; S., 40; S. W., 10; W., 6; N. W., 12. (Three observations daily.)

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF  
OCTOBER, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature	Mean relative humidity.	Rain or melted snow.	Maximum temperature	Minimum temperature	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per ct.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	29.166	56.2	96	1.53	62	54	24	244
2	29.004	70.1	90	.....	79	56	22	270
3	28.994	73.2	82	.....	80	65	30	360
4	28.999	69.1	91	.....	74	68	28	303
5	28.778	67.1	82	0.25	77	61	50	319
6	28.966	63.1	78	0.05	72	53	54	257
7	28.944	58.2	95	0.13	68	51	14	165
8	29.152	44.8	71	1.90	69	43	42	518
9	29.153	46.2	71	.....	51	36	20	227
10	29.001	52.1	76	.....	63	42	22	264
11	28.841	58.9	85	.....	65	42	30	391
12	29.047	61.2	87	.....	69	53	20	132
13	29.332	53.2	76	.....	61	49	14	208
14	29.467	47.5	84	.....	59	43	15	180
15	29.214	53.2	74	.....	62	41	28	285
16	29.058	59.4	76	0.07	68	51	28	255
17	29.026	56.8	55	.....	67	49	20	202
18	29.048	53.7	55	.....	59	46	15	228
19	28.927	61.6	68	.....	70	59	35	613
20	29.055	57.3	78	.....	71	51	30	478
21	28.936	44.9	93	0.29	51	41	15	228
22	29.043	36.2	60	.....	40	34	28	357
23	29.268	28.5	80	.....	34	26	25	412
24	29.086	39.9	52	.....	53	29	36	378
25	29.308	38.8	73	.....	47	30	23	270
26	28.902	45.0	97	0.36	48	38	25	377
27	29.039	33.5	63	.....	47	30	23	335
28	29.183	36.4	76	.....	44	26	25	236
29	29.065	45.6	74	0.02	53	35	23	329
30	29.062	44.9	94	.....	50	44	18	161
31	28.905	39.3	83	.....	45	38	20	214
Sums...	.....	.....	.....	4.60	.....	.....	.....	9,196
Means .	29.063	51.5	78.0	.....	.....	.....	.....	.....

Highest barometer, 29.495 inches; low-st, 28.674 inches. Highest temperature, 80°; lowest, 26°. Range of barometer, 0.821 inches, Range of thermometer, 54°. Maximum velocity of wind, 54 miles from south. Prevailing winds, S., and S. W. Number of clear days, 13; fair days, 11; cloudy days, 7.

Number of times the wind blew from the N., 6; N. E., 4; E., 3; S. E., 6; S., 29; S. W., 18; W., 15; N. W., 12. (Three observations daily.)

**METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF  
NOVEMBER, 1884.**

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS END- ING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature	Mean relative humidity.	Rain or melt- ed snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.953	34.5	90	.17	45	33	20	223
2	29.210	37.8	82	.....	46	26	16	219
3	29.216	41.5	79	.06	48	34	16	169
4	29.100	34.2	89	.17	42	30	20	239
5	29.284	34.0	77	.....	37	30	24	357
6	29.298	34.5	74	.....	41	26	20	237
7	29.115	42.2	75	.....	52	33	24	329
8	29.166	38.5	79	.....	49	30	16	146
9	28.911	49.1	69	.....	60	36	26	295
10	29.181	40.7	87	.....	49	37	20	177
11	29.236	37.4	86	.....	42	35	12	138
12	29.144	40.4	83	.....	49	30	12	116
13	29.118	44.0	77	.....	52	30	16	197
14	29.153	46.6	68	.....	55	37	12	76
15	29.085	43.7	89	.....	56	36	12	139
16	28.877	48.4	87	.05	59	41	15	245
17	29.163	27.8	78	.....	49	25	28	471
18	29.235	25.2	85	.....	33	21	20	275
19	29.003	29.8	88	.....	35	19	20	171
20	28.973	33.1	68	—†	38	26	27	404
21	29.066	35.1	81	.....	40	28	12	167
22	28.706	40.8	97	.43	43	33	18	235
23	28.797	10.7	88	.44	45	2	32	450
24	29.019	9.1	75	.01†	15	-5	27	394
25	28.736	16.5	81	.08	23	5	16	241
26	28.697	19.6	88	.03†	24	5	18	267
27	28.810	22.2	76	.10	28	18	16	188
28	28.824	13.6	83	.....	20	6	18	202
29	29.019	13.9	80	.....	24	11	9	97
30	29.117	17.0	87	.....	24	11	15	166
Sums...	.....	.....	.....	1.53	.....	.....	.....	7,080
Means..	29.038	32.2	81.5	.....	.....	.....	.....	.....

Highest barometer, 29.372 inches; lowest, 28.506 inches. Highest temperature, 60 degrees; lowest, -5 degrees. Range of barometer, 0.866 inches. Range of thermometer, 65 degrees. Maximum velocity of wind, 32 miles from northwest. Prevailing winds: northwest, south, west. Number of clear days, 12; number of fair days, 13; number of cloudy days, 5. Number of times wind blew from the north, 6; northeast, 6; east, 4; southeast, 0; south, 19; southwest, 13; west, 17; northwest, 25. (Three observations daily.)

† Precipitation too small to be measured.

† Estimated.

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF  
DECEMBER, 1884.

DAY.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M. AND 9 P. M. MEANS REFER TO DAY ENDING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS ENDING 2 P. M.	
	Mean daily barometer.	Mean daily temperature.	Mean relative humidity.	Rain or melted snow.	Maximum temperature.	Minimum temperature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per ct.</i>	<i>Inches.</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
1	28.997	23.6	93	0.03	26	9	15	182
2	28.936	29.4	91	.....	32	19	22	266
3	28.740	33.6	77	.....	39	24	22	244
4	28.757	37.7	87	.....	43	32	25	345
5	28.836	33.2	100	0.40	35	28	14	134
6	28.412	37.5	100	1.33	38	34	13	250
7	28.833	32.3	87	0.33	38	30	28	346
8	29.095	32.0	85	.....	34	29	28	427
9	29.244	21.1	78	.....	33	15	30	396
10	29.009	27.5	82	.....	36	19	20	206
11	29.134	21.1	81	—*	25	17	20	233
12	29.224	22.0	85	.....	24	19	35	526
13	29.214	20.5	92	—*	24	19	15	145
14	28.825	24.8	90	0.24	27	19	20	196
15	28.936	12.3	88	.....	24	+ 6	20	291
16	29.113	-1.4	87	.....	+ 9	- 5	18	278
17	29.146	-6.2	82	.....	+ 1	-11	19	257
18	29.461	-16.4	85	.....	- 7	-20	22	334
19	29.417	- 4.4	58	.....	- 2	-20	15	125
20	28.943	+ 9.3	72	0.05**	+11	- 2	25	298
21	28.720	13.6	81	0.01-*	+15	+10	18	137
22	28.920	- 2.3	83	0.30**	+13	- 8	30	316
23	29.211	- 5.2	82	0.30**	- 4	-12	18	162
24	29.352	- 5.3	63	0.10**	+ 1	-10	20	223
25	29.568	- 7.2	75	.....	- 1	-14	15	155
26	29.360	+ 6.0	74	.....	+13	-17	16	56
27	28.914	27.6	96	0.35**	32	+10	22	237
28	28.961	34.9	99	0.07	36	32	15	142
29	29.001	35.8	100	0.22	40	33	18	208
30	28.797	33.3	101	1.62	35	32	10	102
31	28.924	11.3	91	0.34	37	5	40	366
Sums .	.....	.....	.....	5.68	.....	.....	.....	7,633
Means..	29.032	16.8	85.3	.....	.....	.....	.....	.....

Highest barometer, 29.533 inches; lowest, 28.339 inches. Highest temperature, 43°; lowest, -20°. Range of barometer, 1.244 inches. Range of thermometer, 63°. Maximum velocity of wind 40 miles from N. W. Prevailing winds, N. and W.

No. of clear days, 6; 'air days, 10; cloudy days, 15. No. of times the wind blew from the N., 20; N. E., 4; E., 0; S. E., 9; S., 18; S. W., 10; W., 19; N. W., 14. (Three observations daily.)

\*Precipitation too small to be measured. \*\*Estimated.

## METEOROLOGICAL OBSERVATIONS FOR THE YEAR 1884.

MONTH.	OBSERVATIONS TAKEN AT 7 A. M., 2 P. M., AND 9 P. M. MEANS REFER TO DAY END- ING 12 P. M.			FOR 24 HOURS ENDING 9 P. M.			FOR 24 HOURS END- ING 2 P. M.	
	Mean monthly barometer.	Mean monthly temperature.	Mean relative humidity.	Rain or melted snow.	Highest tem- perature.	Lowest tem- perature.	Maximum ve- locity of the wind.	Total move- ment of the wind.
	<i>Inches.</i>	<i>°</i>	<i>Per cent.</i>	<i>Inches</i>	<i>°</i>	<i>°</i>	<i>Miles.</i>	<i>Miles.</i>
January .....	29.074	9.2	81.4	1.68	42	-27	36	8,986
February .....	28.962	16.9	84.0	2.12	37	-13	40	8,247
March .....	28.968	27.4	77.7	2.31	62	-9	45	8,083
April .....	28.930	43.4	69.1	4.51	76	25	45	8,874
May .....	28.919	57.1	67.3	4.21	78	36	32	7,990
June .....	29.031	66.6	80.3	5.47	85	47	36	6,131
July .....	28.907	67.7	73.5	8.44	85	52	78	6,344
August .....	29.009	66.6	76.7	4.39	85	49	60	7,157
September .....	28.975	65.1	79.0	4.25	86	47	54	8,412
October .....	29.063	51.5	78.0	4.60	80	26	54	9,196
November .....	29.088	32.2	81.5	1.53	60	-5	32	7,030
December .....	29.032	16.8	85.3	5.68	43	-20	40	7,633
Sums .....	.....	.....	.....	49.19	.....	.....	.....	93,983
Means .....	28.992	43.38	77.8	.....	.....	.....	.....	.....

Highest barometer, 29.583 inches; lowest, 28.244 inches. Highest temperature, 86 degrees; lowest, -27 degrees. Range of barometer, 1.339 inches. Range of thermometer, 113 degrees. Maximum velocity of the wind, 78 miles from northwest. Prevailing winds, south and northwest. Number of clear days, 124; fair days, 149; cloudy days, 93. Number of days on which rain or snow fell, 144. Number of times the wind blew from the north, 184; northeast, 89; east, 48; southeast, 86; south, 277; southwest, 133; west, 119; northwest, 211. (Three observations daily.)

## X. SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN AT MADISON DURING THE PERIOD 1853-1884.

The Washburn Observatory takes regular meteorological observations, three times daily, for the purpose of continuing the valuable records which have been kept at the University of Wisconsin since 1853. The results of each month's observations are regularly published in various papers in Wisconsin, as well as in the *Monthly Weather Review* of the U. S. Signal Office, and they are thus available to those interested.

In order to obtain the greatest amount of useful information from these current monthly reports, it is necessary to compare them with records for past years. It is for this reason that the present summary has been made, which is intended to supersede all previous abstracts.

### SOURCES FROM WHENCE THE DATA OF THE FOLLOWING TABLES ARE DERIVED.

All the observations were made tri-daily, at 7 A. M., 2 P. M., and 9 P. M. Many of the original records are now at the observatory. Some, however, have been lost. The tables given below are made up as follows: 1853 January to 1864 June, from the manuscript records, supplemented by the observations given in *Results of Meteorological Observations made under the U. S. Patent Office and the Smithsonian Institution from the year 1854 to 1859 inclusive, Vol. I*; 1869 January to 1878 October, from manuscript records, supplemented by the annual reports of Prof. W. W. DANIELLS to the Regents of the University; 1878 October to 1883 April, from manuscript records of the U. S. Signal Service Station at Madison; 1883 April to 1885 January, from manuscript records of observations taken at the Washburn Observatory.

### OBSERVERS AND PLACES OF OBSERVATION.

From 1853 January to 1854 June, the observations were made by Prof. S. H. CARPENTER at the North Dormitory, University. From 1854 June to 1856 January, the ob-

servations were made by Prof. J. W. STERLING, at the North Dormitory, University. From 1856 March to 1857 January, the observations were made by Dr. A. SCHUE, at his office on Main street, city of Madison. From 1857 January to 1864 May, the observations were made by Prof. J. W. STERLING, at the North Dormitory and the Main Building, University. From 1869 January to 1878 October, the observations were made by Prof. W. W. DANIELLS, at the Main Building, University. From 1878 October to 1883 April, the observations were made by Signal Sergeants F. M. M. BEALL and C. A. SHAW, at Brown's Block, city of Madison. From 1883 May to 1883 August, the observations were made by Mr. J. C. OFFICER at the North Dormitory, University. From 1883 August to 1883 December, the observations were made by Mr. JOHN TATLOCK and from 1884 January to 1885 January, by Mr. G. W. BROWN, at the Washburn Observatory.

#### NOTES ON THE OBSERVATIONS.

Besides the special remarks to each table, the following general facts should be noted:

In all cases where the observations were made for a portion of a month only, the rainfall, the number of days on which snow or rain fell, and the movement of wind have been omitted from the monthly means and sums. Up to October, 1879, the maximum and minimum temperatures given, were simply the highest and lowest readings of the thermometer at the regular hours of observation, viz.: 7 A. M., 2 P. M., and 9 P. M. After that date they are read from self-recording instruments. Up to October, 1879, the maximum velocity of the wind is simply the greatest velocity recorded (estimated) by the observer at the hours 7, 2, 9. The maximum velocity during May, June, July, 1883, is the greatest velocity recorded by the anemometer at the hours 7, 2, 9. During the rest of the series it is the highest velocity of the 24 hours as read from the anemometer sheets. This is usually computed by selecting that five minutes of the anemometer sheet which contains the greatest number of miles, and by multiplying this number by 12. In special cases of very high winds (above 60 miles per hour) a shorter

time than five minutes is sometimes taken as a basis for computation. Occasionally the rate of motion of high winds has been deduced by observing the times of consecutive clicks of the anemometer magnet by the mean time clock.

A careful examination of all the original records by Mr. BROWN has shown that the barometer readings between August, 1877, and October, 1878, are probably erroneous. The monthly means are constantly from 0.1 to 0.4 inch below the means of twenty years' observations for these three months. They are accordingly omitted here.

Table I gives the mean monthly barometer at  $32^{\circ}$ ; mean monthly temperature, Fahr.; maximum and minimum recorded temperature for the month; the range of temperature for the month, which is the difference of the maximum and minimum temperatures; the rainfall for the month; the mean monthly relative humidity; the number of days on which rain or snow fell during the month; the prevailing wind of the month; the maximum velocity of the wind during the month; the miles traveled by the wind during the month.

Table II gives a summary of the data of Table I, arranged by years, including the years 1869-1884 only, these years being complete.



TABLE I.—METEOROLOGICAL OBSERVATIONS BY MONTHS FROM 1853 TO 1884.

## OBSERVATIONS FOR JANUARY.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. of days on which rain or snow fell.	Prevailing wind.	Max'm velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	29.242	25.3	...	...	...	...	...	...	...	...	...
1854...	28.990	13.0	46	-19	65	...	...	6	S. W.	60	...
1857...	29.162	5.6	37	-25	62	...	45	[4]	N. W.	25	...
1858...	29.018	31.2	54	9	45	1.83	75	3	S. W.	25	...
1859...	29.040	20.7	42	-12	54	...	79	4	W.	35	...
1860...	...	21.9	44	-9	53	...	...	...	W.	25	...
1861...	28.941	15.0	35	-15	50	0.50	83	7	S. W.	35	...
1862...	29.046	14.5	36	-22	58	1.50	...	9	W.	25	...
1863...	28.948	25.7	48	4	44	...	...	7	S.	25	...
1864...	29.010	14.8	45	-29	74	0.60	...	3	S. W.	25	...
1869...	28.961	23.7	42	-11	53	2.69	94	7	S. W.	25	...
1870...	28.893	17.8	35	-12	47	3.25	86	10	S. W.	35	...
1871...	28.994	20.7	55	-2	57	2.32	91	9	N. W.	35	...
1872...	28.916	17.5	40	-15	55	1.20	90	6	S. W.	12	...
1873...	28.850	10.9	33	-21	54	1.40	98	8	N.	35	...
1874...	28.978	18.9	57	-12	69	3.64	90	10	S. W.	25	...
1875...	29.073	3.6	33	-25	58	0.90	97	13	W.	12	...
1876...	28.934	24.5	46	-6	52	2.31	91	10	W.	25	...
1877...	29.067	12.9	43	-16	59	1.00	87	5	S. W.	14	...
1878...	...	25.1	45	-9	54	0.40	90	3	N. W.	14	...
1879...	29.055	19.7	46	-22	68	0.79	63	8	N. E.	31	7,276
1880...	28.937	34.5	58	6	52	2.75	73	13	S.	40	8,688
1881...	29.062	12.6	35	-20	55	2.05	74	13	S.	25	6,506
1882...	28.968	22.4	48	-8	56	1.33	73	13	S. W.	38	7,480
1883...	29.043	8.5	35	-23	58	1.01	72	18	N. W.	25	6,666
1884...	29.074	9.2	42	-27	69	1.68	81	11	N. W.	36	8,986
Means.	29.008	18.0	44.0	-15.7	59.7	1.60	81.6	8.6	S. W.	32.7	7,600

## OBSERVATIONS FOR FEBRUARY.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	29.011	19.2	46	-10	56	.....	.....	7			
1854...	29.013	24.3	47	-5	52	.....	.....	4	N. W.	45	
1857...	29.271	25.0	48	-13	61	1.75	71	6	S. W.	25	
1858...	29.088	16.4	39	-13	52	0.59	71	8	N. W.	25	
1859...	28.970	24.5	56	-5	61	.....	71	10	N. W.	25	
1860...	.....	23.4	50	-10	60	2.30	.....	2	S.	25	
1861...	28.862	25.0	50	-5	55	1.45	80	7	S.	35	
1862...	29.005	14.5	43	-18	61	0.38	.....	5	W.	25	
1863...	29.080	21.7	43	-8	51	.....	.....	.....	S. W.	25	
1864...	28.903	22.8	50	-19	69	2.10	.....	4	N. W.	35	
1869...	28.932	22.9	50	-1	51	2.35	89	6	N. W.	35	
1870...	28.871	20.9	44	-15	59	1.35	88	6	N. W.	35	
1871...	28.859	23.7	46	-4	50	1.43	87	8	S.	35	
1872...	28.899	19.2	48	-10	58	0.40	88	3	W.	25	
1873...	28.857	15.6	40	-20	60	0.60	95	2	W.	12	
1874...	28.995	21.0	41	-10	51	0.95	91	4	S. W.	12	
1875...	28.955	3.4	27	-21	48	2.80	83	9	W.	12	
1876...	28.934	24.3	51	-12	63	1.60	91	7	S.	12	
1877...	29.108	32.6	52	15	37	0.30	86	2	N.	14	
1878...	.....	32.8	53	13	40	1.19	82	6	N.	14	
1879...	29.042	22.0	46	-12	58	2.54	70	11	N. W.	30	7,842
1880...	28.936	28.2	55	0	55	1.75	70	9	N. W.	35	8,740
1881...	29.047	18.9	44	-4	48	5.42	76	16	N. W.	40	8,123
1882...	29.052	33.2	64	4	60	1.74	73	11	W.	30	8,008
1883...	29.169	17.0	49	-17	66	1.64	72	16	W.	28	6,112
1884...	28.962	16.9	37	-13	50	2.12	84	19	N.	40	8,247
Means.	28.992	21.9	49.2	-7.0	56.2	1.67	80.9	7.5	N. W.	33.8	7,846

## OBSERVATIONS FOR MARCH.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (in. h. s).	Mean relative humidity (per cent)	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	28.968	32.3	61	7	54	.....	.....	6	N. W.	25	.....
1854...	28.920	36.2	66	10	56	.....	.....	5	N. W.	45	.....
1856...	29.080	25.9	52	— 6	58	.....	.....	.....	W.	.....	.....
1857...	29.038	27.9	59	0	59	0.78	63	4	S. W.	25	.....
1858...	28.965	36.6	66	4	62	1.94	5	6	N. W.	25	.....
1859...	28.722	36.6	61	24	37	3.07	73	11	N. W.	35	.....
1860...	.....	39.1	65	19	44	0.27	40	4	W.	35	.....
1861...	28.968	29.0	56	9	47	.....	.....	6	N.	25	.....
1862...	28.819	28.0	86	6	80	[1.85]	.....	[6]	N. E.	25	.....
1863...	28.701	26.0	45	14	31	[1.50]	.....	[3]	N.	25	.....
1864...	28.859	32.0	52	4	48	1.40	.....	.....	N.	60	.....
1869...	28.948	25.5	59	— 1	60	0.79	83	10	N. W.	25	.....
1870...	28.934	27.0	42	— 8	50	3.85	85	13	N. W.	25	.....
1871...	28.814	35.4	60	20	40	2.96	75	9	W.	35	.....
1872...	28.758	23.8	40	3	37	2.18	82	11	N.	12	.....
1873...	28.886	30.8	52	— 5	57	2.07	75	6	N. W.	25	.....
1874...	28.935	29.7	47	10	37	0.95	69	3	W.	25	.....
1875...	28.826	25.1	64	1	63	0.90	70	7	W.	25	.....
1876...	28.955	27.8	58	0	58	2.27	93	10	N. W.	12	.....
1877...	28.988	23.2	50	— 1	51	3.40	84	12	N.	12	.....
1878...	.....	44.0	69	28	41	2.43	73	9	N.	12	.....
1879...	28.967	37.7	68	5	63	1.34	56	11	N. W.	40	8,626
1880...	29.006	36.6	57	7	50	2.11	68	8	W.	35	9,645
1881...	28.972	28.5	49	— 1	50	4.34	74	10	N. W.	45	8,561
1882...	28.993	34.4	62	14	48	4.73	75	13	N. W.	34	9,734
1883...	28.995	27.1	53	1	52	0.38	71	10	N. W.	32	7,606
1884...	28.968	27.4	62	-- 9	71	2.31	78	14	N.	45	8,083
Means.	28.918	30.9	58.5	2.8	55.7	2.05	72.2	8.0	N. W.	38.5	8,375

## OBSERVATIONS FOR APRIL.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	28.964	44.3	65	27	38	.....	.....	9	N. W.	60	.....
1854...	28.987	47.3	79	23	56	.....	.....	6	N. E.	25	.....
1856...	28.990	48.0	68	25	43	2.50	.....	.....	S	.....	.....
1857...	28.947	35.1	63	14	49	1.90	63	11	N. W.	25	.....
1858...	28.771	42.8	77	25	52	4.74	65	13	N. E.	25	.....
1859...	28.890	40.6	68	22	46	3.07	.....	8	S. W.	40	.....
1860...	.....	45.3	70	30	40	0.68	61	3	S.	35	.....
1861...	28.853	46.0	74	29	45	.....	.....	.....	S.	35	.....
1862...	28.993	42.5	62	19	43	2.00	.....	9	N.	25	.....
1863...	29.018	47.6	70	27	43	.....	.....	.....	S.	35	.....
1864...	28.950	43.7	74	34	40	1.40	.....	.....	N.	35	.....
1869...	28.868	36.7	63	12	51	2.72	75	9	W.	25	.....
1870...	28.949	49.7	78	34	44	0.18	54	3	S.	25	.....
1871...	28.692	46.0	82	33	49	2.00	61	11	S. W.	35	.....
1872...	28.870	45.8	77	23	54	1.82	56	10	S. W.	25	.....
1873...	28.801	42.4	80	29	51	1.26	36	5	N. W.	25	.....
1874...	29.031	36.8	63	13	50	1.26	66	7	N. E.	25	.....
1875...	28.882	43.3	62	11	51	1.87	68	7	S. W.	25	.....
1876...	28.880	49.4	66	30	36	2.65	72	8	S. W.	12	.....
1877...	28.977	45.3	74	18	56	0.00	74	2	N.	12	.....
1878...	.....	52.3	73	40	33	2.97	67	12	S. W.	20	.....
1879...	28.934	48.2	82	12	70	3.33	70	6	S.	48	7,613
1880...	28.883	46.6	78	23	55	5.48	65	13	W.	41	9,758
1881...	28.986	40.9	73	11	62	1.50	71	12	N. W.	28	6,228
1882...	29.009	44.9	78	22	56	4.21	71	13	E.	44	8,613
1884...	28.930	43.4	76	25	51	4.51	69	11	N. W.	45	8,874
MEANS.	28.919	44.5	77.4	18.6	58.8	2.38	66.3	8.5	S. W. S.	11.2	8,217

## OBSERVATIONS FOR MAY.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.)	Monthly movement of wind (miles).
1853...	28.963	54.6	81	37	44	.....	.....	13	N. W.	60	.....
1854...	28.855	57.5	78	39	39	.....	.....	15	S. E.	45	.....
1855...	29.017	61.9	87	34	53	2.60	46	5	N. E.	25	.....
1857...	28.914	53.0	80	23	57	5.28	54	...	S.	35	.....
1858...	28.977	52.7	73	38	35	8.39	67	18	N. W.	25	.....
1859...	29.050	60.5	79	44	35	.....	57	9	S. W.	35	.....
1860...	.....	61.6	81	43	38	2.74	.....	14	S.	45	.....
1861...	28.928	53.6	85	34	51	2.10	.....	6	E.	35	.....
1863...	28.968	57.6	81	36	43	.....	.....	.....	N.	45	.....
1864...	28.864	55.0	84	33	51	.....	.....	3	S.	60	.....
1869...	28.916	54.4	82	41	41	4.90	73	12	N. E.	25	.....
1870...	28.853	65.0	85	49	36	1.09	52	6	S.	25	.....
1871...	28.909	61.0	86	38	48	3.31	61	9	N. E.	25	.....
1872...	28.855	57.5	79	39	40	2.83	61	9	N. W.	12	.....
1873...	28.842	55.2	76	39	37	3.53	66	10	E.	25	.....
1874...	28.893	59.4	90	42	48	2.14	67	7	N. E.	25	.....
1875...	28.858	59.0	83	31	52	2.61	58	8	S. W.	12	.....
1876...	28.969	59.5	83	36	47	5.18	69	15	S. W.	12	.....
1877...	28.991	60.7	83	34	49	1.02	73	2	S.	12	.....
1878...	.....	54.6	77	41	36	4.64	70	8	N. W.	14	.....
1879...	28.950	61.0	86	35	51	3.91	60	9	S. E.	36	7,482
1880...	28.936	65.5	86	44	42	4.45	62	15	S.	30	7,344
1881...	28.997	68.2	88	35	53	4.25	68	10	E.	36	5,750
1882...	28.976	51.7	78	33	45	2.89	72	14	N. E.	30	8,346
1883...	28.893	51.5	78	33	45	6.98	81	11	S. W.	.....	.....
1884...	28.912	57.1	78	36	42	4.21	67	14	S. W.	32	7,890
Means.	28.929	58.0	82.3	36.3	46.0	3.76	64.2	10.0	S. N. E.	32.8	7,362

## OBSERVATIONS FOR JUNE.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. of days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	28.957	70.0	89	53	36	.....	15	S. W.	25	.....	
1854...	28.957	67.7	89	44	45	.....	11	S. E.	25	.....	
1855...	28.927	64.0	88	43	45 [6.44]	62	[10]	N. W.	35	.....	
1856...	28.950	74.0	96	53	43 3.25	.....	.....	S. W.	.....	.....	
1857...	28.846	64.6	85	45	39 2.67	63	4	S.	25	.....	
1858...	28.956	70.1	89	49	40 4.72	68	14	S. E.	25	.....	
1859...	29.040	64.3	84	39	45 3.33	60	9	S.	25	.....	
1860...	.....	67.6	81	52	29 [6.37]	65	[6]	N.	60	.....	
1861...	28.953	69.1	85	53	32	.....	4	N. W.	35	.....	
1863...	29.013	65.0	87	53	34	.....	.....	N. W.	35	.....	
1869...	28.868	62.5	79	49	30 6.24	74	10	S. W.	25	.....	
1870...	28.911	72.2	98	53	45 1.92	57	7	N. W.	25	.....	
1871...	28.900	69.3	89	54	35 4.93	62	11	W.	35	.....	
1872...	28.858	67.0	90	55	35 2.44	64	8	S.	12	.....	
1873...	28.862	73.0	89	55	34 5.60	68	9	S. W.	25	.....	
1874...	28.878	63.3	92	54	38 2.85	78	9	S. W.	35	.....	
1875...	28.793	64.1	80	51	29 3.37	75	7	S. E.	12	.....	
1876...	28.801	68.2	87	42	45 4.57	77	7	S. W.	12	.....	
1877...	28.866	65.9	83	47	36 4.77	79	7	S.	12	.....	
1878...	.....	65.8	86	48	38 4.20	69	8	N.	35	.....	
1879...	28.972	67.4	86	42	44 2.80	70	10	S.	22	6,030	
1880...	28.938	69.6	87	50	37 9.31	71	16	S. W.	50	6,077	
1881...	28.911	66.4	90	49	41 4.15	75	11	E.	36	6,227	
1882...	28.889	64.5	87	42	45 7.78	73	17	E.	48	6,412	
1883...	28.872	65.2	86	47	39 7.57	84	15	N.	.....	.....	
1884...	29.031	66.6	85	47	38 5.47	80	10	S.	36	6,131	
Means.	28.915	67.2	86.8	46.2	40.6	4.78	70.2	10.0	S. W.	38.2	6,175

## OBSERVATIONS FOR JULY.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	29.059	67.8	81	57	24	...	58	6	S. W.	15	.....
1856...	29.030	75.8	97	65	32	2.80	...	...	S. W.	...	.....
1857...	29.036	75.1	95	60	35	[3.00]	61	...	S.	...	.....
1858...	29.080	72.1	85	60	25	2.35	64	7	N. E.	25	.....
1859...	29.060	75.8	93	51	42	2.41	63	3	S.	35	.....
1869...	28.951	69.0	84	59	26	3.63	73	10	N. W.	45	.....
1870...	28.888	73.8	91	58	33	5.25	64	6	S. W.	35	.....
1871...	28.928	71.1	90	56	34	2.11	59	9	W.	35	.....
1872...	28.892	73.4	92	60	32	1.26	65	6	S. W.	25	.....
1873...	28.923	71.7	91	53	38	0.82	68	5	S. W.	12	.....
1874...	28.967	75.4	96	62	34	5.19	63	5	S. W.	25	.....
1875...	28.955	73.0	86	62	24	0.97	71	5	S. E.	25	.....
1876...	28.930	74.5	89	61	28	4.14	70	8	S.	25	.....
1877...	28.921	73.0	88	61	27	3.84	73	8	N. W.	12	.....
1878...	...	74.9	92	61	31	7.56	74	12	S. E.	12	.....
1879...	28.946	74.3	91	55	36	5.91	71	7	S. W.	32	5,449
1880...	28.981	71.9	93	53	40	6.00	72	13	N. W.	25	5,343
1881...	29.016	73.1	92	56	36	9.47	75	10	N.	32	5,321
1882...	29.014	66.8	87	50	37	2.70	74	13	N. W.	22	5,884
1883...	28.928	70.2	89	52	37	8.89	80	12	S. W.	...	.....
1884...	28.907	67.7	85	52	33	8.44	74	12	N. W.	78	6,344
Means.	28.971	72.4	89.5	55.0	36.5	4.40	68.6	8.2	S. W.	37.8	5,668

## OBSERVATIONS FOR AUGUST.

YEAR.	Mean monthly bar-ometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (percent.).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	28.989	70.3	90	48	42	...	...	5	S. W.	25	.....
1856...	29.050	70.0	93	59	34	1.58	53	...	W.	...	.....
1857...	29.094	69.5	89	57	32	2.00	59	4	N. W.	25	.....
1860...	...	67.5	84	55	29	...	...	[4]	N. W.	45	.....
1869...	29.014	66.9	89	54	35	5.92	79	9	N. W.	25	.....
1870...	28.926	67.1	89	56	33	3.65	65	10	S.	25	.....
1871...	28.915	69.8	91	52	39	3.35	68	9	N. W.	35	.....
1872...	28.949	70.4	90	53	37	2.24	67	7	S. W.	25	.....
1873...	28.957	71.9	91	58	33	2.76	69	5	S. W.	35	.....
1874...	28.970	71.1	93	58	35	1.40	65	6	N. E.	12	.....
1875...	28.947	69.6	86	52	34	2.57	71	6	S.	25	.....
1876...	28.960	73.1	90	56	34	3.42	72	6	S.	25	.....
1877...	...	67.8	86	59	27	3.76	69	10	N. W.	25	.....
1878...	...	72.2	86	59	27	4.28	71	10	N. W.	25	.....
1879...	28.953	70.6	90	47	43	0.99	67	8	S.	40	6,054
1880...	29.012	71.0	92	52	40	5.90	74	13	S.	30	5,691
1881...	29.041	73.2	95	52	43	0.56	69	8	S.	32	5,499
1882...	29.006	69.1	87	50	37	6.83	81	15	N.	35	5,502
1883...	29.027	66.1	86	51	35	2.74	78	5	S. W.	36	5,458
1884 ..	29.009	66.6	85	49	36	4.39	77	14	S.	60	7,157
Means.	28.989	69.8	89.2	50.2	39.0	3.24	69.7	8.3	S.	38.8	5,974



## OBSERVATIONS FOR SEPTEMBER.

YEAR.	Mean monthly barometer, (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.).	No. of days on which rain or snow fell	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	29.020	61.4	87	38	49	.....	.....	10	S. W.	45	.....
1854...	29.156	64.9	93	42	51	.....	.....	4	S.	25	.....
1857...	29.074	62.9	84	41	43	2.93	62	3	S.	25	.....
1859...	.....	.....	.....	.....	.....	2.00	.....	.....	.....	.....	.....
1860...	.....	58.5	83	41	42	3.33	73	7	S. E.	35	.....
1861...	29.015	60.0	88	40	48	2.77	.....	9	S. W.	25	.....
1863...	29.064	59.3	84	34	50	.....	.....	.....	S.	35	.....
1869...	29.033	61.8	79	40	39	2.68	73	6	S.	25	.....
1870...	29.030	61.2	83	54	29	4.00	54	11	N. E.	12	.....
1871...	29.045	59.8	88	40	48	0.47	56	4	N. W.	12	.....
1872...	28.854	62.1	89	39	50	5.11	71	10	S. W.	25	.....
1873...	28.930	55.4	87	40	47	2.54	67	7	N. W.	25	.....
1874...	28.961	64.4	90	46	44	5.46	73	13	S. W.	25	.....
1875...	29.009	58.9	81	36	45	2.06	66	14	S.	25	.....
1876...	28.835	59.8	79	36	43	3.41	77	8	N. W.	35	.....
1877...	.....	65.8	86	47	39	0.64	71	4	S. W.	12	.....
1878...	.....	62.9	85	42	43	6.54	70	7	S.	45	.....
1879...	29.033	62.0	78	37	41	2.68	73	5	S.	30	7,284
1880...	29.013	60.6	85	40	45	4.44	71	11	S.	30	6,185
1881...	28.908	64.8	92	46	46	8.17	77	16	S.	45	6,864
1882...	29.081	61.5	85	43	42	1.91	79	7	E.	23	5,266
1883...	29.058	56.6	79	38	41	2.39	76	6	S.	36	6,448
1884...	28.975	65.1	86	47	39	4.25	79	11	S.	54	8,412
Means.	29.004	61.4	84.2	42.4	41.8	3.40	70.5	8.2	S.	36.3	6,742

## OBSERVATIONS FOR OCTOBER.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent).	No. days on which snow or rain fell.	Prevailing wind.	Maximum velocity of wind (miles per hr).	Monthly movement of wind (miles).
1853...	29.042	46.6	68	21	47	.....	.....	5	S. E.	35	.....
1854...	29.045	54.1	80	23	57	.....	.....	3	S	25	.....
1857...	29.098	46.8	72	27	45	2.00	76	5	N. W.	60	.....
1858...	29.050	47.7	74	35	39	1.74	71	9	S. W.	35	.....
1859...	.....	46.8	79	22	57	.....	.....	6	N., S.	35	.....
1860...	29.041	49.9	75	33	42	2.23	.....	9	N. W.	60	.....
1861...	28.959	49.0	74	30	44	.....	.....	6	S.	25	.....
1862...	28.976	50.0	82	22	60	.....	.....	.....	S.	45	.....
1863...	29.028	40.7	65	29	36	3.25	.....	5	S.	60	.....
1869...	28.954	37.7	71	19	52	6.60	65	7	N. W.	25	.....
1870...	28.956	50.4	70	29	41	2.09	75	9	W.	35	.....
1871...	28.885	52.0	80	27	53	3.07	68	8	W.	25	.....
1872...	28.971	49.0	76	30	46	0.60	61	6	N. W.	25	.....
1873...	28.914	45.1	73	20	53	1.96	68	8	S. W.	25	.....
1874...	28.848	51.0	71	30	41	1.44	76	6	S. E.	12	.....
1875...	28.930	46.1	77	27	50	1.96	63	10	S. W.	12	.....
1876...	28.853	45.8	66	23	43	1.59	74	3	S. W.	25	.....
1877...	.....	51.2	78	33	45	4.12	75	13	S. W.	12	.....
1878...	28.959	49.6	74	20	54	3.78	68	15	N. W.	50	8,519
1879...	29.069	58.0	84	24	60	2.50	67	8	S.	30	7,787
1880...	29.011	48.5	75	26	49	1.68	67	6	S.	44	8,069
1881...	29.041	51.6	77	33	44	9.12	80	20	S. E.	24	7,044
1882...	28.975	54.4	78	35	43	4.14	77	8	S.	32	6,456
1883...	29.081	46.3	79	28	51	3.79	80	11	S. E.	48	8,372
1884...	29.063	51.5	80	26	54	4.60	78	9	S.	54	9,196
Means.	28.989	48.6	78.1	27.4	50.7	3.11	71.6	8.8	S.	40.3	7,920

## OBSERVATIONS FOR NOVEMBER.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent.)	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hr.).	Monthly movement of wind (miles).
1853...	29.110	38.8	56	14	42	.....	.....	13	N. W.	25	.....
1854...	28.860	37.0	65	17	48	.....	.....	5	N. W.	25	.....
1855...	28.950	33.1	52	13	39	4.92	71	...	S.	.....	.....
1857...	28.888	29.3	57	— 3	60	0.72	71	3	S. W.	60	.....
1858...	29.020	31.7	49	7	42	1.37	86	13	N. W.	35	.....
1859...	.....	36.4	68	19	49	1.39	.....	7	N., S.	25	.....
1860...	28.910	33.3	63	— 4	67	1.32	.....	9	W.	25	.....
1861...	28.884	37.2	52	23	29	.....	.....	.....	S. W.	25	.....
1862...	29.041	33.3	52	21	31	.....	.....	.....	S.	45	.....
1863...	28.967	35.4	56	8	48	2.50	.....	4	N. W.	45	.....
1869...	28.862	30.6	60	14	46	2.05	82	10	N. W.	35	.....
1870...	28.924	38.6	64	19	45	0.53	67	5	N. W.	35	.....
1871...	28.965	30.9	58	3	55	2.31	74	6	N. E.	25	.....
1872...	28.900	27.2	54	— 4	58	0.76	85	3	N. W.	25	.....
1873...	28.886	28.2	50	2	48	2.15	85	7	N. W.	25	.....
1874...	28.970	32.6	69	— 3	72	3.29	77	9	W.	25	.....
1875...	28.987	31.0	54	—11	65	0.40	81	6	N.	12	.....
1876...	28.926	34.8	63	14	49	2.31	84	5	N. W.	12	.....
1877...	.....	34.7	47	11	36	2.81	77	11	S. W.	12	.....
1878...	28.968	40.0	58	24	34	0.76	70	6	N. W.	25	6,722
1879...	28.994	33.7	67	11	56	6.02	73	10	S.	40	7,909
1880...	29.084	26.8	60	— 7	67	1.68	72	12	W.	29	7,915
1881...	28.990	34.6	59	6	53	2.56	76	18	W.	32	9,884
1882...	29.087	38.3	66	17	49	2.62	82	11	S.	28	6,894
1883...	28.996	34.5	60	2	58	2.56	77	8	S.	60	19,547
1884...	29.038	32.2	60	— 5	65	1.53	82	11	N. W.	32	7,030
Means.	28.967	33.6	61.4	6.9	54.5	2.11	77.4	8.3	N. W.	35.1	8,129

## OBSERVATIONS FOR DECEMBER.

YEAR.	Mean monthly barometer (inches) at 32° F.	Mean monthly temperature.	Maximum temperature.	Minimum temperature.	Monthly range of temperature.	Rain or melted snow (inches).	Mean relative humidity (per cent).	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles pr. hr.)	Monthly movement of wind (miles).
1853...	28.946	26.0	48	1	47	.....	.....	[5]	N. W.	25	.....
1856...	29.038	13.0	35	-10	45	[3.25]	60	[8]	W.	45	.....
1857...	29.021	30.8	48	17	31	0.75	84	4	S. W.	25	.....
1858...	29.016	22.5	40	-11	51	.....	82	3	S. W.	35	.....
1860...	29.054	19.0	35	-6	41	1.00	91	5	N. W.	25	.....
1861...	29.194	25.5	49	2	47	[0.50]	.....	[3]	S. W.	25	.....
1862...	29.025	27.3	46	5	41	.....	.....	.....	S. W.	25	.....
1863...	28.994	21.5	39	-15	54	1.70	.....	6	N. W.	35	.....
1869...	28.993	23.3	39	-2	41	2.64	89	7	W.	25	.....
1870...	28.910	22.1	43	-13	61	0.67	87	7	W.	35	.....
1871...	28.926	18.4	39	-15	53	1.15	87	10	W.	12	.....
1872...	29.043	9.5	38	-28	66	1.60	96	8	N. W.	35	.....
1873...	28.998	26.0	43	2	41	1.80	88	8	S. E.	25	.....
1874...	28.977	22.6	50	-15	65	0.45	84	6	N. W.	12	.....
1875...	28.790	31.9	54	-11	65	2.18	87	8	N. W.	12	.....
1876...	29.064	11.1	41	-22	63	2.59	70	6	N. W.	25	.....
1877...	.....	38.7	57	23	34	2.01	80	8	S. W.	12	.....
1878...	28.965	22.0	39	-9	47	0.79	66	8	W.	29	7,891
1879...	29.005	21.1	54	-12	66	2.29	74	15	W.	30	7,873
1880...	29.086	17.0	40	-21	61	1.17	75	19	W.	32	7,402
1881...	29.086	33.1	49	6	43	1.32	74	14	S.	40	8,330
1882...	29.025	21.7	43	-13	56	2.03	78	20	N. W.	38	6,853
1883...	29.009	22.3	51	-11	62	1.95	82	9	N. W.	40	8,934
1884...	29.032	16.8	43	-20	63	5.68	85	17	N.	40	7,638
Means.	29.004	22.4	45.6	-11.3	56.9	1.75	80.9	9.4	N. W.	35.6	7,845

## REMARKS TO ACCOMPANY TABLE I.

January; 1857, 23 days observations only.

January; 1860, 20 days observations only.

March; 1862, 27 days observations only.

March; 1863, 26 days observations only.

April; 1883, no observations.

May; 1864, 16 days observations only.

May; 1883, 26 days observations only for the barometer, mean temperature and rainfall; and 21 days only for the maximum and minimum temperature.

June; 1855, 19 days observations for barometer, and 28 days for the other entries.

June; 1860, 26 days observations only.

June; 1863, 25 days observations only.

July; 1857, 20 days observations only.

August; 1860, 23 days observations only.

November; 1861, 26 days observations only.

November; 1863, 24 days observations for barometer.

December; 1856, 23 days observations only.

December; 1861, 20 days observations only.

December; 1853, 23 days observations only.

In all cases where the observations were given for a portion only of the month, the rainfall, No. of days of rain or snow, and the movement of wind have been omitted from the means and sums.

The mean barometer, temperature, rainfall, relative humidity, No. of days of snow or rain, and prevailing winds are derived from the whole series 1853-1883.

The mean highest temperature, the lowest, the range, the mean maximum velocity of the wind, and the monthly movement of the wind are derived from the data of the years 1879-1884 only, for reasons previously given.

TABLE II.—SUMMARY OF METEOROLOGICAL OBSERVATIONS  
FROM 1869 TO 1884, BY YEARS.

N. B.—See remarks at end of the table.

YEAR.	Mean yearly barometer (inches.)	Mean yearly temperature.	Highest temperature of the year.	Lowest temperature of the year.	Range of temperature for the year.	Rain, or melted snow. (inches.)	Mean relative humidity. Per cent.	No. days on which rain or snow fell.	Prevailing wind.	Maximum velocity of wind (miles per hour.)	Yearly movement of wind. (miles.)
1869	28.966	42.9	89	—11	100	43.27	79.2	103	N. W.	45	.....
1870	28.920	47.2	98	—13	111	27.83	69.5	98	N. W.	35	.....
1871	28.903	46.1	91	—15	106	29.51	70.7	103	W.	35	.....
1872	28.897	44.4	92	—28	120	22.44	73.9	87	{ S. W. N. W.	35	.....
1873	28.893	43.8	91	—21	112	26.49	76.5	80	{ N. W. S. W.	35	.....
1874	28.950	45.5	96	—15	111	29.02	74.1	85	S. W.	35	.....
1875	28.917	42.4	86	—25	112	22.59	74.2	100	{ W. S. W.	25	.....
1876	28.921	46.1	90	—22	112	36.04	78.8	98	{ N. W. S. W.	35	.....
1877	.....	47.7	88	—16	104	27.67	77.8	84	S. W.	25	.....
1878	.....	49.7	92	—9	101	39.54	71.7	104	N. W.	50	[23, 132]
1879	28.993	47.9	91	—22	113	35.10	68.7	106	S.	48	87,425
1880	28.989	48.1	93	—21	114	46.72	70.0	138	{ S. W.	50	90,855
1881	29.001	46.9	95	—20	115	52.92	72.4	158	{ N. W. S.	45	84,342
1882	29.005	47.1	87	—13	100	42.89	75.3	160	{ N. W. W.	48	85,448
1883	29.006	42.3	89	—23	112	39.84	77.9	121	{ N. W. S.	60	[60, 139]
1884	28.992	43.4	86	—27	113	49.19	77.8	144	S.	78	93,963
Means.	28.954	45.7	90.2	—21.0	111.2	35.69	74.2	108	.....	54.1	88,211

REMARKS.—For 1878, the maximum velocity of the wind and the No. of miles traveled were observed for October, November, December, only.

For 1883, the same data are for 233 days only; the maximum and minimum thermometer and range of temperature for 323 days. The other data for 323 days.

The mean barometer, temperature, rainfall, humidity, No. of days on which snow or rain fell, are given from all the data 1869-1884. The mean highest and lowest temperature, the range, and the maximum velocity and number of miles traveled by the wind, relate only to the years 1879-1884.

TABLE III—SUMMARY OF THE PRECEDING METEOROLOGICAL OBSERVATIONS BY MONTHS.

MONTH.	Mean monthly barometer (inches). 1853—1884.	Mean monthly temperature. 1853—1884.	Mean maximum temperature. 1879—1884.	Mean minimum temperature. 1879—1884.	Mean monthly range of temperature. 1879—1884.	Mean monthly fall of rain or melted snow (inches). 1853—1884.	Mean relative humidity (per cent.). 1855—1884.	Mean number of days on which rain or snow fell. 1853—1884.	Mean direction of wind. 1853—1884.	Mean maximum velocity of wind (miles per hour). 1879—1884.	Mean monthly movement of the wind (miles). 1879—1884.
January..	29.008	18.0	44.0	-15.7	59.7	1.60	81.6	8.6	S. W.	32.7	7,600
February.	28.992	21.9	49.2	-7.0	56.2	1.67	80.9	7.5	N. W.	33.8	7,846
March...	28.918	30.9	58.5	2.8	55.7	2.05	72.2	8.0	N. W.	38.5	8,375
April....	28.919	44.5	77.4	18.6	58.8	2.38	66.3	8.4	{ S.W. S.	41.2	8,217
May.....	28.929	58.0	82.3	36.3	46.0	3.76	64.2	10.0	{ S. N.E.	32.8	7,362
June.....	28.915	67.2	86.8	46.2	40.6	4.75	70.2	10.0	S. W.	38.2	6,175
July.....	28.971	72.4	89.5	53.0	36.5	4.40	68.5	8.2	S. W.	37.8	5,668
August...	28.989	69.8	89.2	50.2	39.0	3.24	69.7	8.3	S.	38.8	5,974
Sept.....	29.004	61.4	84.2	42.4	41.8	3.40	70.5	8.2	S.	36.8	6,742
October..	28.989	48.6	78.1	27.4	50.7	3.11	71.6	8.3	S.	40.3	7,920
Nov.....	28.967	33.6	61.4	6.9	54.5	2.11	77.4	8.3	N. W.	35.1	8,129
Dec.....	29.004	22.4	45.6	-11.3	56.9	1.75	80.9	9.4	N. W.	35.6	7,845
Means...	28.967	45.7	.....	.....	49.7	2.85	72.8	8.5	.....	36.8	7,821
Sums....	.....	.....	.....	.....	.....	34.22	.....	103.2	.....	.....	87,853

TABLE IV.—DATES OF OPENING AND CLOSING OF THE LAKES AT  
MADISON, 1855-1886.

YEAR.	MONONA.		MENDOTA.
	Opened.	Closed.	Opened.
1856 .....	April 7 .....	Dec. 4 .....	—
1857 .....	May 4 .....	Nov. 17 .....	—
1858 .....	March 26 .....	Dec. 11 .....	—
1859 .....	March 15 .....	Dec. 6 .....	March 14.
1860 .....	March 18 .....	Dec. 5 .....	March 18.
1861 .....	April 10 .....	Dec. 1 .....	April 10.
1862 .....	April 13 .....	Nov. 7 .....	April 14.
1863 .....	April 1 .....	Dec. 7 .....	April 16.
1864 .....	April 20 .....	Dec. 9 .....	April 21.
1865 .....	April 5 .....	Dec. 14 .....	April 5.
1866 .....	April 18 .....	Dec. 12 .....	April 18.
1867 .....	April 19 .....	Dec. 14 .....	April 20.
1868 .....	March 31 .....	Dec. 10 .....	March 31.
1869 .....	April 15 .....	Nov. 24 .....	April 16.
1870 .....	April 11 .....	Dec. 22 .....	April 12.
1871 .....	April 1 .....	Nov. 30 .....	April 1.
1872 .....	April 20 .....	Nov. 28 .....	April 20.
1873 .....	April 17 .....	Nov. 29 .....	April 18.
1874 .....	April 14 .....	Dec. 12 .....	April 14.
1875 .....	April 14 .....	Jan. 10, '76 .....	April 15.
1876 .....	April 10 .....	Dec. 5 .....	April 10.
1877 .....	April 15 .....	Jan. 7, '78 .....	April 15.
1878 .....	March 10 .....	Dec. 16 .....	March 9.
1879 .....	April 10 .....	Dec. 16 .....	April 12.
1880 .....	March 18 .....	Nov. 22 .....	March 25.
1881 .....	May 1 .....	Jan. 1, '82 .....	May 3.
1882 .....	March 19 .....	Dec. 7 .....	March 21.
1883 .....	April 13 .....	Dec. 17 .....	April 13.
1884 .....	April 15 .....	Dec. 17 .....	April 15.
1885 .....	April 17 .....	.....	April 20.



## ERRATA IN VOLUME I.

- Page 85; No. 40; A and C; for 1871.50, read 1881.50.  
Page 85; No. 41; for 20773, read 21063.  
Page 87; No. 50. for 1781, read 1881.  
Page 87; No. 50; for 1884, read 1881.
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## ERRATA IN VOLUME II.

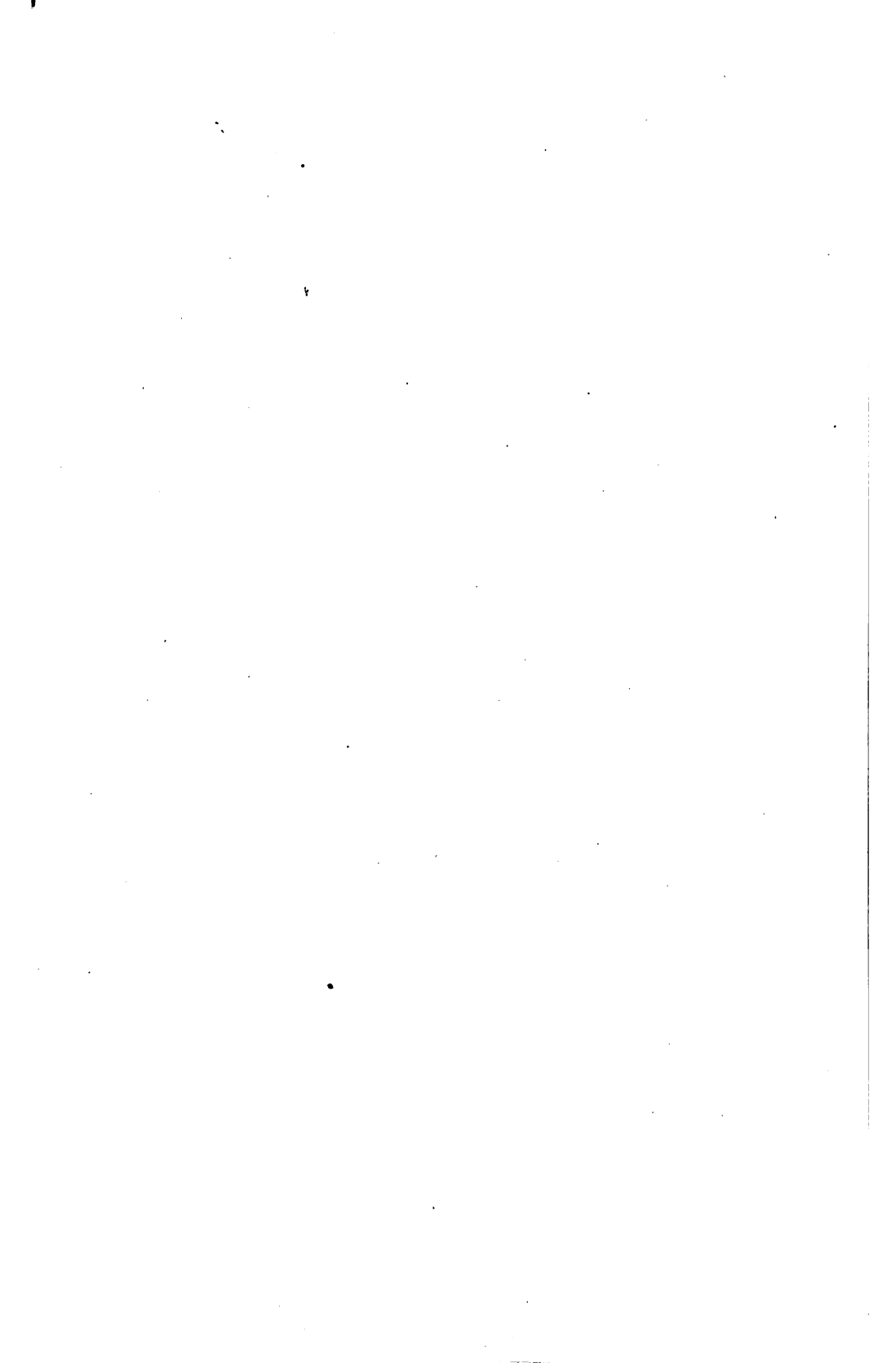
- Page 28. The eye pieces furnished by the Messrs. REPSOLD were made by STEINHEIL. The erroneous statement to the contrary in the text, which I desire to recall, was based upon the judgment of two professional opticians.
- Page 50. It should have been clearly stated that the small size of the Meridian Circle Room, and the height of the collimator piers prevent the taking of reflex observations of the stars except over a very narrow range. It was for this reason that no attention was paid to having the same nadir reading Circle W. and Circle E.
- Page 88. In the formula for  $R_{\text{mer}} \text{ dele } \sin 1''$  in the second term.
- Page 89. Line 11; for page 78 read page 76.
- Pages 93-4-5. All observations of stars with the meridian circle made before May 1, 1884, have been rejected, these among the rest.
- Page 98. No. 95. The star is Cord. Z. C. 8<sup>h</sup>, 897.
- Page 98. No. 99. The star is Cord. Z. C. 9<sup>h</sup>, 3281.
- Page 99. No. 112. For 28° read 21°; for 14' read 9':
- Page 99. No. 118. The star is Cord. Z. C. 13<sup>h</sup>, 32. R. A. 13<sup>h</sup> 0m 47<sup>s</sup>, Dec -52° 4'.
- Page 99. No. 132. The star is Cord. Z. C. 17<sup>h</sup>, 770.
- Page 100. No. 151. The star is No. 35, Vol. I., p. 84.
- Page 269. Table. Right hand argument. For + $\delta$  read - $\delta$ .
- Page 305. Jan. 10: for 1.7 read 11.7.
- Page 306. Feb. 4: for +8 read -8.
- Page 314. Nov. 6: for 0.32 read 0.62.
- Page 314. Total rainfall for November: for 2.26 read 2.56.
- Page 316. Ditto.
- Page 316. Total rainfall for year: for 39.54 read 39.84.
- Page 319. Ditto.
- Page 316: July. For 29.928 read 28.928.
- Page 25\* under KONKOLY. For 2883 read 1883.
- Page 50\* under WATSON, For af read of.

### ERRATA IN VOLUME III.

- Page 3; Col. date; lines 9, 10, 11; *for † read ‡*.  
Page 3; Col. date; lines 12, 13; *insert †*.  
Page 49; foot note; No. 138; *for 1 read 1<sup>s</sup>*.  
Page 50; No. 165; Epoch; *for 137 read 133*.  
Page 51; No. 174; Number and No. Obs. *interchange 4 and 65*.  
Page 51; No. 183; R. A. *should be*  $7^h 47^m 13^s. 51$ .  
Page 52; No. 201; R. A. *should be*  $8^h 17^m 24^s. 23$ .  
Page 55; No. 290; Epoch; *for 284 read 282*.  
Page 59; No. 380; R. A. *should be*  $11^h 58^m 34^s. 67$ .  
Page 63; No. 472; R. A. *should be*  $13^h 56^m 43^s. 94$ .  
Page 70; No. 669; *Remove ? after Decl.*  
Page 70; No. 673; *Insert ? after Decl.*  
Page 78; No. 884; R. A. *should be*  $18^h 47^m 29^s. 11$ .  
Page 78; No. 884; Dec. *should be*  $23^\circ 20' 0''. 3$ .  
Page 81; No. 948; R. A. *should be*  $19^h 59^m 39^s. 50$ .  
Page 81; No. 949; R. A. *should be*  $20^h 2^m 34^s. 21$ .  
Page 82; No. 975; TACCHINI'S No. *for 497 read 498*.  
Page 83; No. 995; Dec. *should be*  $24^\circ 44' 56''. 4$ .  
Page 88; No. 79; Dec. *is*  $30^\circ 37' 53''. 3$ .  
Page 92; No. 197; R. A. (Cordoba) *is*  $58^s. 91$ .  
Page 93; No. 227; Dec. (Stone) *is*  $31''. 3$ .  
Page 94; No. 250; R. A. *is*  $15^h 47^m 59^s. 53$ .

















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